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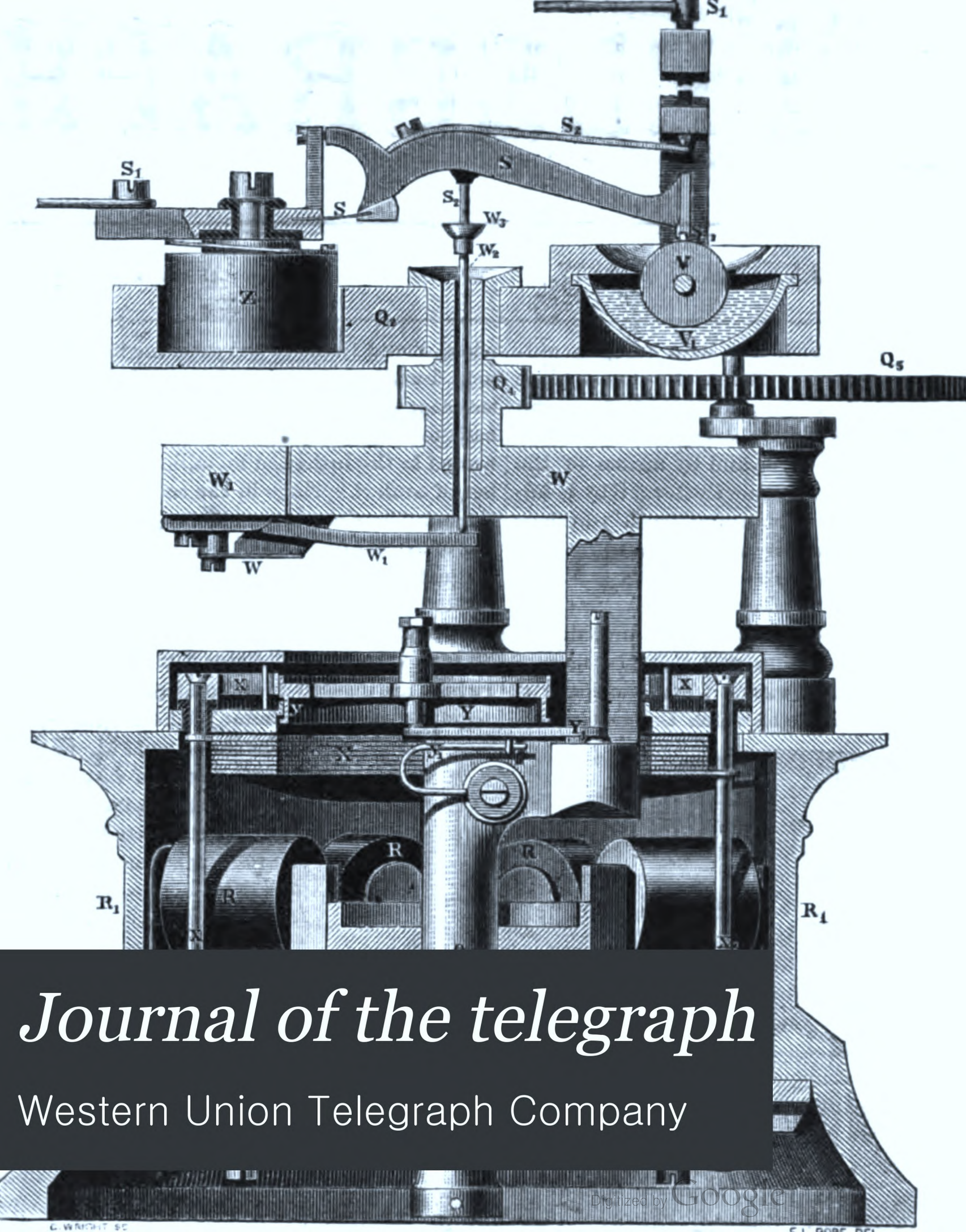

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Western Union Telegraph Company

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JOURNAL OF THE TELEGRAPH.

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PHELP'S ELECTRO-MOTOR PRINTING TELEGRAPH.*

(*Concluded from page* 370, Vol. IX.)

The electro-motor and its governor are mounted upon the base of the instrument at the left and to the rear of the hollow column A, which contains the transmitting mechanism. The motor consists of eight electro-magnets arranged in a circle, within which a revolving shaft carries a circular row of soft iron armatures, five in number. The commutator is so connected that the electro-magnets act successively as the armatures come within their influence, and cease to act just as the latter arrive at a point opposite to the poles of the magnets. By this means a constant attraction is exerted upon the armature, which causes the shaft to revolve with great rapidity. The motor is provided with a centrifugal governor, which acts to reduce the quantity of electricity flowing through the actuating magnets whenever the speed becomes too great, by which means its motion is rendered perfectly uniform.

Fig. 10 is a horizontal transverse section of the motor, showing the arrangement of the electro-magnets and armatures, and construction of the commutator, and fig. 11 is a vertical transverse section of the same. The figures are half the size of the actual parts.

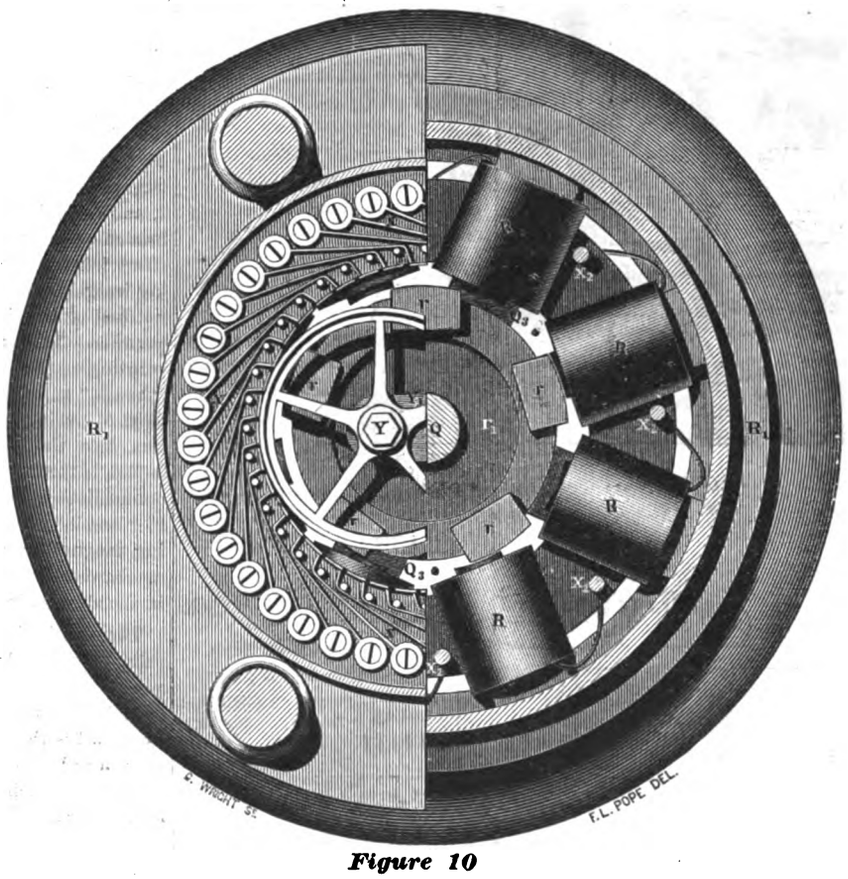

Figure 10

The electro-magnets R R, etc., eight in number, are arranged in a circle within a cylindrical case R_1. The magnets are of the ordinary form, having cores 0.5 inches diameter, and 1.25 inches in length, wound with insulated copper wire 0.042 inches diameter. Five soft iron armatures, *r r*, etc., are arranged at equal distances around the periphery of a hub r_1 of brass, upon a vertical shaft Q, supported at its lower end in an adjustable step or bearing Q_1 and at its upper end in a top plate Q_2. The motor battery is connected by the screw s_1 to the insulated lever S, which is mounted upon a spring *s*, and pressed downward by the action of the screw S_1, acting upon a flat spring S_2. The screw S_1 serves to regulate the speed of the machine in the manner about to be explained. W is a thick piece of metal mounted upon the main shaft Q of the motor, and serves as a counterbalance or fly-wheel. A section of this, W_1, is mounted upon a spring *w*, and has an arm w_1, attached to it. The rapid revolution of the shaft Q when the motor is in motion, tends to throw the section W_1 (which acts as a weight) outwards by centrifugal force. When this takes place the arm w_1 is raised, then pin w_2 (which passes through the upper part of the shaft Q, the latter being hollow,) is forced upwards and by means of the cup w_3 and insulated pin s_3 raises the lever S by bending the spring S_3. V is a platinum faced wheel or disc, which revolves slowly by means of a worm acting upon a toothed wheel fixed upon its axis, not shown in the figure. The wheel V revolves in a cup V_1 partially filled with oil. The platinum edge of the wheel V and the platinum stud s_3 on the lever S are in contact at all times, except when the speed of revolution exceeds the rate to which the machine is adjusted by the screw S_1. The constant motion of the wheel V keeps the contact surfaces clean, and there is but little friction on account of the oil. When the speed of the machine becomes too great, the weight W_1, being thrown out by the centrifugal force as its supporting spring *w* bends, raises the inner end of the arm w_1, which lifts the lever S by means of the rod w_2, breaking the contact between s_2 and V, and by thus diminishing the battery force, at once lessens the speed of the motor. The current from the motor battery, passing through the lever S, wheel V and frame of the machine to the commutator next described, is directed through the several electro-magnets in succession, and finally finds its way back to the battery by a common battery wire connected to the insulated metallic ring Q_3. The number of contact springs in the commutator, is equal to the number of electro-magnets multiplied by the number of armatures, viz., forty. Each separate electro-magnet is charged each time it is approached by either of the five armatures during their revolution. This is effected by connecting each of the magnets R R, etc., with one of eight flat metallic segments X (which are insulated from each other, and placed close together within the frame of the machine), by means of insulated rods x_2, to which the magnet wires are fastened. Five of the forty commutator springs *x x*, etc., are connected to each of the conducting segments X X by means of studs x_1, passing through the frame and insulated therefrom, each fifth spring being connected by means of its corresponding stud to the same conducting segment. The frame or case R_1 of the motor has a circular opening in its top plate, within which opening the contact wheel Y runs. This wheel Y is mounted at the end of a link Y_1, which is hinged to a projection from the main shaft Q, and is constantly pressed against the inner edge of the opening in the frame by a spring y_1, so that the frictional contact is always sufficient to turn the contact wheel. The periphery of the latter is grooved as shown at *y*, and runs upon the edge of the opening, as upon a railway track. The contact wheel Y also runs in contact with the ends of the commutator springs *x x*, which yield sufficiently to bring each successive one into contact with the wheel before the preceding one is out of contact. The portion of the periphery of the wheel Y, which runs in contact with the springs, is of larger diameter than that which runs upon the frame, as will be seen by referring to the figure. The object of this arrangement is to cause the surface of the wheel Y to slide or rub upon the springs *x x* as it revolves, and thus keep the surfaces clean without unnecessary wear.

It will of course be understood that the wheel Y forms an electrical connection between the frame and the successive commutator springs as it revolves, and thus charges the electro-magnets in rotation, each magnet being charged five times during one revolution of the main shaft Q, by which means each arma-

* From advanced sheets of Prescott's "Electricity and the Electric Telegraph," now in press.

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ture is attracted and released at the proper moment.

In order to avoid the spark which would otherwise be produced at each breaking of the contact between the stud s_2 and the platinum faced contact wheel V, a permanent connection is made between the screw s_1 and the frame of the machine by means of a resistance coil Z, which, when the contact between s_2 and V is interrupted, conveys a sufficient quantity of current from the battery to the motor to cause the latter to revolve, but at a rate of speed considerably less than the normal rate to which the machine is adjusted. The effect of breaking and closing the contact between s_2 and V is therefore merely to increase and diminish the total resistance of the circuit by an amount equal to the value of the resistance Z, and the extra or induced current, having a path through the coil Z, occasions but an inappreciable spark upon the contact wheel V.

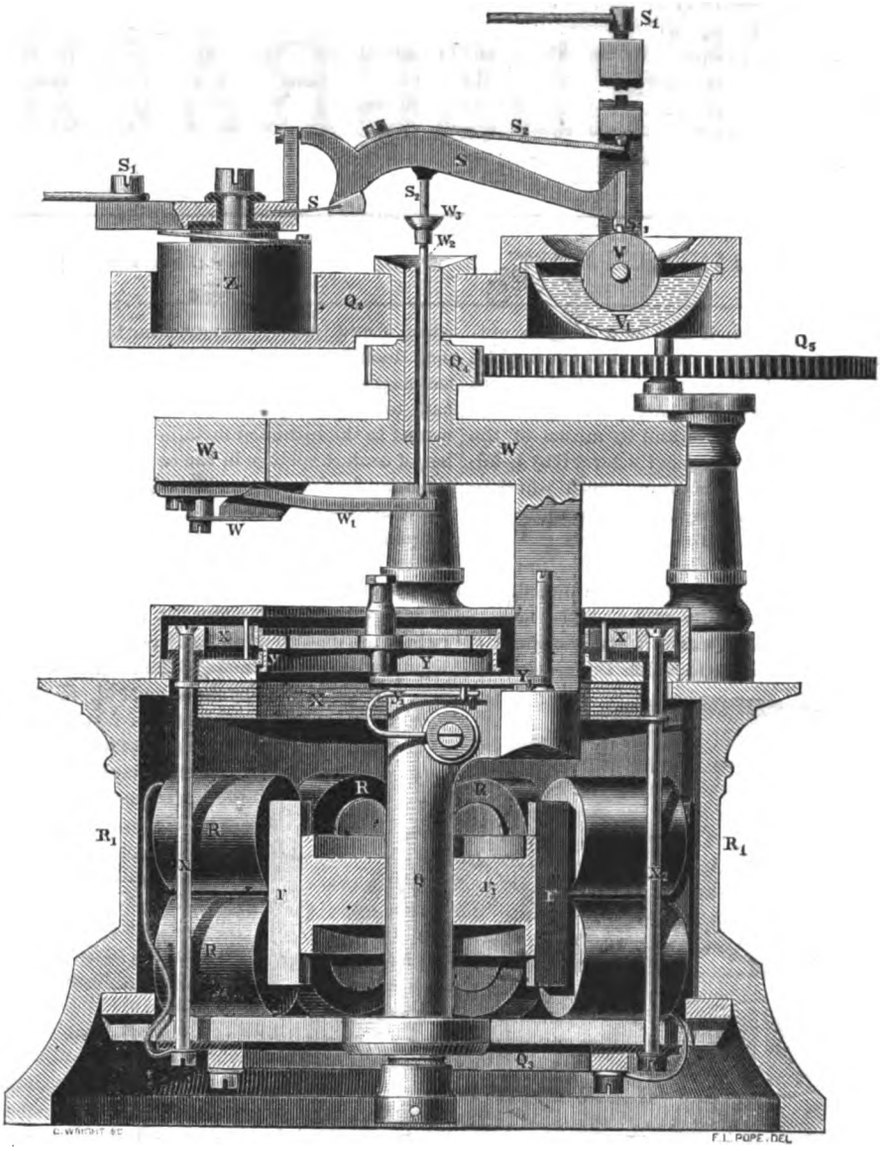

Figure 11.

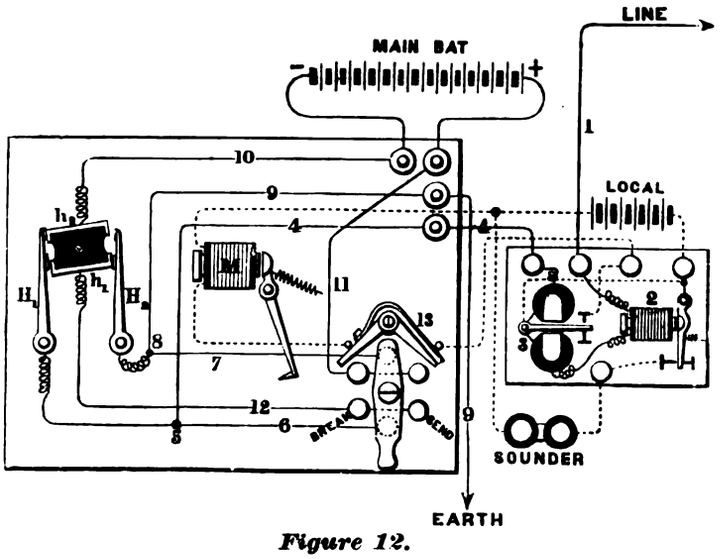

Figure 12.

The revolution of the motor is communicated to the instrument by means of a pinion Q_4, which gears into a wheel Q_5, of about four times the number of teeth, and this in turn is geared directly to the hollow wheel E upon the shaft C of the transmitting machinery (figs. 2 and 3.)

The arrangement of the main and local circuits of the Phelps instrument is shown in the diagram, fig. 12. The switch is placed at the right of the key board, and is represented in position for receiving. The current enters at 1 and passes through the relays 2 and 3, thence by wires 4, 5 and 6, through the switch, and thence by wires 7, 8 and 9 to the earth. The relay 3 is a polarized relay of Siemens's or other suitable construction, and closes its local circuit under the influence of the posiitve pulsations sent to line by the transmitting instrument. The auxiliary relay 2 has a non-polarized or neutral armature, and is very much less sensitive than the relay 3, so that it is not effected by the ordinary pulsations passing over the line. The object of this relay is to enable the receiver to break or stop the sender during the transmission of a despatch, or to answer a call signal, as will be hereafter explained. The relay 3 operates the printing magnet M by means of a local battery of six small cells. If the receiver wishes to stop the sender, he turns his switch to the position marked "break," which throws his own main battery into the line circuit, by way of 5, H_1 h_2 10, 11, switch lever 15, h_1 H_2 and 8. The effect of this is to double the strength of the pulsations passing through the relay 2, and cause it to actuate a small sounder placed in a branch circuit from the common local battery. This effect takes place upon both the sending and receiving instruments, and the sending operator it thus notified of the interruption by the working of the sounder. The break 13 opens the local circuit of the printing magnet M, whenever the switch is turned to "break," and thus prevents the printing mechanism from operating, and introducing superfluous characters into the printed record. When sending, the switch is turned to the point marked "send," the connections being precisely the same as when turned to "break," except that the local circuit of the printing magnet now remains intact, and the printing mechanism may be stopped, if desired, by pushing in the stop O_1 in fig. 7.

The manipulation of this instrument is theoretically very simple, although it will be obvious that a vast amount of practice is required on the part of an operator before he can expect to be able to finger the keyboard with the skill and rapidity which is necessary in order to develop the full capacity of the instrument, which exceeds even that of the combination. For example, an actual trial was made, an operator sending continuously for five consecutive minutes, the matter being an ordinary newspaper despatch from Washington, selected at random. The number of words transmitted during this length of time was 290, containing 1, 634 characters, inclusive of letters, points and spaces, or 58 words per minute—a rate of speed which some of the more skilful operators can maintain for a long time. By a careful analysis of the above despatch it was found that the alphabetical sequence of the letters was such that an average of two characters could be printed from during each revolution. Therefore, by depressing two keys and permitting the instrument to revolve at the normal rate, its actual capacity was easily ascertained

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by counting the number of revolutions per minute. This was found to be 166,—332 letters, or 59.3 words per minute.

The operator, before commencing to transmit a despatch, sets his motor in motion by closing the circuit of the motor battery by means of a button switch at the left of the keyboard. He then turns his switch to "send," and depresses a certain predetermined series of keys, the pulsations from which operate the relay and printing magnets of each instrument with a distinctly audible sound, serving as an alarm. The receiving operator signifies his readiness to proceed by changing the position of his switch from "send" to "break" for a moment, which causes the sending operator's pulsations to manifest themselves upon his own sounder. The sender then depresses his blank or dash key, transmitting the the pulsations in groups of three, with an interval between each group, so that the receiver may adjust the speed of his motor. When the latter has accomplished this he signals the sender by turning the swith to "break" for a moment. The sender then allows the instrument to make a few revolutions, so as to bring the automatic unison of the receiving instrument into action, and then proceeds to transmit his communication, letter by letter, being careful to commence with the dash or blank key. In case the two instruments get out of correspondence, which seldom happens unless the line is in bad order, the receiver can stop the sender at any time by turning the switch to "break."

The local battery which drives the motor consists of two large Bunsen cells, charged with Poggendorff's bichromate solution in contact with the carbons in the porous cell, and diluted sulphuric acid in the outer or zinc cell. The containing jars are of glass, 9 inches in diameter and 6 inches high. The zinc cylinders are 8 inches outside diameter and 0.5 inches think, within which is placed a porous cell 7.5 inches diameter. The carbon element consists of two rectangular plates, placed parallel and about two inches apart, each plate being 5 by 6.5 inches. This battery will run the motor continuously for fifteen hours without requiring a renewal of the bichromate solution.

It has not been found necessary to adapt any repeater to this system, as it has proved itself capable of working direct at full speed between New York and Chicago, a distance of 1,000 miles by the route of the line.

FULLER BATTERY

This is a modification of the bichromate of potash battery. It is composed of an exterior glass jar containing a solution of bichromate of potassium (1 part bichromate, 3 sulphuric acid and 9 water), in which the carbon plate is placed. Inside the glass jar is a porous cup—the bottom of which is covered with a layer of mercury to the depth of about half an inch. The zinc is cylindrical in form and terminates in a foot which rests in the mercury. The remaining portion of the porous cup is filled with a solution of sulphuric acid and water, 1 part acid to 40 of water. The improvement claimed by the inventor consists in maintaining the zinc always standing in the mercury, which renders the battery very constant. Its electro-motive force is about double that of the Daniell, while its internal resistence is low, and, even when the exterior resistence is quite small, the battery remains remarkably constant. It is already employed on several English railroads. M. Despointes, of the Submarine Telegraph Company, states that this battery has worked well with the Hughes apparatus since the 4th of February, 1876, on one of the busiest circuits between London and Paris, and up to the 3rd of July it had not been necessary to renew it, the battery being still strong and in good condition. Forty Fuller cells did the work for which 60 Marie-Davy, or from 75 to 80 Daniell cells, were formerly required.

M. Higgins, of the Exchange Telegraph Company says that he has employed the battery to work the printing apparatus of the company. In order to produce the proper current to supply two lines at the same time, it is necessary that the internal resistance of the three cells should not exceed 1 ohm.

Printing 500 impressions per day, the bichromate solution lasts 12 days; but the solution containing the zinc requires to be renewed three times. The same quantity of bichromate solution, in the ordinary battery, would last eight days, and should be supplied in three chargings. The battery has worked perfectly on four circuits for six months. In the opinion of M. Goldstone, of the London and South Western Railway, the Fuller battery seems destined to replace the ordinary battery for work requiring constant current; but the test has hardly been prolonged a sufficent length of time to enable one to pronounce definitely on the subject.—*Annales Telegraphique.*

M. PLANTE'S THEORY OF THE FORMATION OF HAIL.

Mr Plante considers that atmospheric electricity, in the state of a discharge or dynamic flux, produces a powerful calorific action capable of vaporizing water in clouds rapidly, and of projecting the vapor so formed into the cold regions of the atmosphere. In order to show the effect of the electricity in this phenomenon, it will suffice, he says, to mention the mechanical action which takes place on the passage of the electrical discharge through aqueous masses, and the projection into the air of liquid globules susceptible of becoming transformed into hailstones. With a source of intense voltaic electricity, the immersion of the positive wire into a conducting liquid, such as salted water, determines the aggregations of the aqueous molecules around the electrode, in the form of a luminous spheroid. This is due to the double simultaneous effect of scattering and aspiration which appears to be peculiar to the electric discharge.

If a more intense current be employed, coming from a battery of 400 secondary couples, instead of a single globule at the positive pole, a cluster of innumerable globules is obtained, which succeed each other with great rapidity, and which are projected for more than three feet from the vessel containing the water. The spark produced at the same time at the surface of the liquid appears as a corona or aureola of many points, from which the aqueous globules escape.

To produce this effect the electrode need not be of metal. A piece of filtering paper, moistened with salt water, in communication with the positive pole, causes a like result, and constitutes a humid mass analogous, in certain measure to that of a cloud whence an electric discharge escapes. If in place of meeting a deep layer of liquid, the current simply comes in contact with a damp surface, such as the sides or bottom of the vessel, the calorific effects predominate, the aureola is more brilliant, and the water is rapidly transformed into steam.

It thus appears that the action of the current differs according to the resistance opposed to it, and thus here is found a new example of the reciprocal substitution of heat and mechanical work resulting from the electric shock. When the work represented by the violent projection of the liquid was visible, neither heat nor steam was developed; but when this does not take place, the powerful calorific effects at once are noticeable.

From these experiments M. Plante concludes:

1. That electric discharges produced in clouds may, according to the more or less great density of the moist conductors, determine their reduction into vapor or their instantaneous aggregation into globules of volume much larger than the cloud globules themselves; and that the liquid bombs thus formed may be projected to great heights, where a very low temperature prevails.

2. That the formation of hailstones, in cases where they do not present a series of opaque and transparent layers, but a radisting structure, is also explained by this mechanical action.

3. That the ovoidal or pyramidal form of the stones, as well as their protuberances, asperities, etc., are due to their electrical origin.

4. That the light sometimes emitted by hailstones is also due to electricity, the discharge producing them rendering them at the same time phosphorescent.

THE COOPER INSTITUTE AS A LIGHTNING PROTECTOR.

The principle function of elevated points is to dissipate slowly a certain comparitively small portion of atmospheric electric charges, but without perfect ground connections they will certainly and utterly fail to accomplish this. If the metallic roof of a house is properly connected by a good conductor with the moist earth, the house will be better protected than with a so-called lightning, rod as commonly put up. Many bouses possess accidentally such a protection by the lead of the roof, gutters, water pipes, etc., and intelligent architects of Europe often make use of these existing metallic parts, and by proper attachments complete the system of electric conductors from the metallic roof to the ground without making the existence of a protective system apparent.

The Cooper Institute of this city, the highest central part of which has a metallic roof, some 130 feet above the ground, and projects above all surrounding buildings, is in its interior incidentally so well protected by a series of iron columns and iron beams supporting all the floors (forming a completely connected iron frame, seven stories high, all in perfect contact to the very foundations, and with the gas, water and steam pipes), that in 1859 the editor of this Journal gave his advice against the putting up of a lightning rod as utterly useless; it has never been attached to this building, and during his residence there, from 1859 to 1864, severe thunder storms damaged several other buildings within a radius of 1,500 feet, but of course could do no damage to this immense mass of metal, which, during that time, and no doubt since, has often been struck, but which could not be noticed, except by electrometric and magneto-metric observations made during the prevalence of the storms.—*The Manufacturer and Builder.*

TELEGRAPHING THE PRESIDENT'S MESSAGE.

The transmission of the President's message across the continent yesterday over the wires of the Western Union Telegraph Company was one of the most remarkable telegraphic feats on record. Every word of it was sent between 11:05 A. M. and 2:26 P. M. The performance was remarkable not only for speed, but for accuracy, showing skilled manipulation on the part of officials and operators all along the line. —*San Francisco Chronicle Dec, 6th.*

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Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,800. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcome as a friend. No better medium for dvertising exists.

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NEW YORK, JANUARY 1, 1877.

QUARTERLY DIVIDEND.

The Western Union Telegraph Company has declared a quarterly dividend of one and one-half per cent. on the capital stock of the company from the net earnings of the three months ended Dec. 31, payable at the office of the Treasurer on and after the 15th day of January next, to shareholders of record on the 20th day of December.

The transfer books were closed at 3 o'clock on the afternoon of Dec. 20th and will be opened on the morning of the 16th of January.

There seems to be little doubt now of the speedy conclusion of a working arrangement of some nature between the Anglo-American and the Direct Cable Companies, which will likely culminate in complete amalgamation as soon after as the necessary forms of law can be observed. The Globe Telegraph and Trust Company are the prime movers in the present scheme, and as that Company holds a large interest in both Cable Companies, it has peculiar advantages for bringing about such a desirable result.

PRESERVING THE ORIGINAL COPIES.

IMPORTANT ACTION OF THE WESTERN UNION COMPANY.

The Executive Committee of the Western Union Telegraph Company adopted a resolution on Wednesday, Dec. 20th, declaring that all messages sent by the company were in the exclusive custody and under the control of the executive committee or the board of directors. The committee called a special meeting of the board of directors, which met on Friday, 22d, and unanimously adopted resolutions authorizing the president of the company to make all proper legal resistance to the demand of the House of Representatives and its committees for private and confidential papers; also giving the managers of the company the power and directing them to destroy the original copies of all messages as soon as this may be done without interfering with the auditing of accounts. Some time ago the managers were directed to destroy copies of messages after six months, instead of two years, as had previously been the rule, but it is believed this time may easily be reduced to four months without serious inconvenience to the accountants, and the necessity of holding them more than from 30 to 60 days can be removed, if necessary, by going to some additional expense.

THE ATLANTIC AND PACIFIC TELEGRAPH COMPANY.

The Report of the Atlantic and Pacific Telegraph Company, which was prepared in January, 1870, following the agreement with the Union Pacific Railroad Company in September, states that the Company then had 2,476 miles of line and 5,438 miles of wire, including those belonging to the Union Pacific Railroad Company. The following statement, compiled from the official reports, will show the annual increase in the lines, wires and traffic of the Atlantic and Pacific Telegraph Company from 1870 to 1875 inclusive:

Years.	Miles of Line.	Miles of Wire.	Receipts.	Expenses.	Profits.
1870	2476	5438			
1871	2540	6030	$272,423 57	$245,055 92	$27,367 65
1872	2724	7034	333,895 34	292,740 01	44,155 33
1873	3197	7680	372,627 81	333,351 85	39,275 96
1874	3927	8403	*450,534 01	329,101 97	51,422 04
1875	4397	9874	‡386,826 97	396,399 75	†

* Including receipts of Franklin Telegraph Company, from Nov. 20th, to Dec. 31st, inclusive.

† Loss, in 1875, $9,572 78.

‡ Up to the close of 1874 the Atlantic and Pacific Company managed to keep free from debt, and even earned a small surplus each year. At the beginning of 1875 the control of the Company passed into the hands of the present management, resulting at the end of the year in a net loss of $9,572, and a floating debt of $279,204.83.

The foregoing statement of the number of miles of line and wire is taken from the official reports up to 1875. The subsequent additions are made from the statement of lines and wire constructed each year, as shown in the President's report to the stockholders for 1874 and 1875. These reports show that in 1874 728 miles of line and 728 of wire, and in 1875 472 miles of line and 1466 miles of wire were constructed or acquired by the company, which, added to the amount of them in 1873, makes a total of 4,339 miles of line and 9,874 miles of wire erected or acquired by the company at the close of 1875.

Comparing the above correct statement with the official report for 1875 shows a difference of 247 miles of line and 903 miles of wire.

The report for 1875 gives the receipts of the company at $386,826.97, and claims "a gain of $24,545.73 notwithstanding the general depression of business, the loss of the Signal Service, the Southern connections, and the reduction of rates!"

The report for 1874 gives the receipts of the Atlantic and Pacific Company, including those of the Franklin Company, from November 20th to December 31st at $450,534.01. Now, the receipts of the Franklin Company for the time named, as appears from the report of that company, were $31,554.09, which, deducted from the total receipts of the Atlantic and Pacific Company, leaves $418,979.92 as the receipts of he latter for 1874, or $32,152.95 more than the receipts of 1875.

Another notable feature in the business of the Atlantic and Pacific Co. for the past year, as compared with previous years, when the lines were under different management, is shown by the fact, that in 1874 they made $51,422.04 net earnings, while in 1875 there was a deficit of $9,572.78, and a debt incurred of $279,204.83.

In 1873 the Atlantic and Pacific had 95 offices and 7,680 miles of wire, and in 1875, 360 offices and 9,871 miles of wire, and yet *the gross receipts of the company for* 1875 *were* $32,152.95 *less then they were in* 1873. If an increase of over 250 offices and 2,000 miles of wire is followed by a decrease of over $32,000 in the gross receipts of the Atlantic and Pacific Company in a single year, what encouragement is there for the further extension of the system?

From the above-mentioned result we fear that some discount must be made upon the statement in the report for 1875, that "there had been 23 per cent. increase in the volume of business and 17 per cent. increase of cash receipts, without any increase of expenses resulting from the reduction in rates!"

PHELPS' MOTOR PRINTER QUADRUPLEXED.

We publish in the present number of the JOURNAL the concluding portion of the description of Phelps Electro Motor Printer. This instrument has been for some time in successful operation between New York and Washington, in connection with Mr Gerritt Smith's improved Quadruplex. Only two instruments at each end, however, being worked at present, for the transmission and reception of messages; the other two sides of the Quadruplex being simply used for breaking or signalling. With two instruments at New York, and two at Washington, connected by a single wire, 110 words per minute are regularly transmitted in the ordinary course of business. If the business should require it, two more instruments at each end can be connected on the same wire, thus enabling the operators to transmit 220 words per minute upon a single wire, each operator sending at the ordinary rate of 55 words per minute.

HONORABLE MENTION.

One of the most pleasing duties which falls to the lot of journalists, is that which allows the recording of honorable and praiseworthy actions. It gives us much pleasure to print the following from the minutes of the Brunswick (Ga.) Relief association, in

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reference to the conduct of master Cornelius Casey a messenger in the service of the Western Union Telegraph Company at that place, during the yellow fever epidemic in the Fall.

WHEREAS, Cornelius Casey, a telegraph messenger of the Western Union Telegraph Co., only twelve years of age, in the most terrible days of the epidemic, when *our* operators and the operators sent us from abroad were stricken down with the yellow fever, took charge of the office for four days and kept up our communication with the outside world, sending and receiving dispatches correctly, although it was not until then known that he understood telegraphing, he having picked it up in the office, and

WHEREAS, But for his action our community would have been entirely shut out from communication with the outside world,

RESOLVED, That the thanks of this Association are due and are hereby tendered the said Cornelius Casey for his services as above stated and that a copy of this Resolution be published in the Brunswick *Advertiser*, and a copy sent to Hon. Wm. Orton, President W. U. Telegraph Co.

THE BOGUS NEWS SWINDLE.

The swindler, who in October last used the wires of the Western Union Company to forward a bogus dispatch to the Associated Press, announcing the death of Commodore Vanderbilt, to which he forged the signarure of the Rev. Mr. Deems of this city, has been unearthed, is in custody, and it is to be hoped, will receive due punishment. His name is Condit, and he claims to be a dealer in real estate. He is the same person, who, a week or two since, sent a bogus despatch from Newark, to Kiernan's News Agency in New York, to which he signed the name of the *New York Herald* Correspondent, stating that the President and other officials of the Central Railroad of New Jersey were before the Chancellor of that State to apply for the appointment of a Receiver for the road. Condit has been fully identified both in New York and in Newark.

NEW YORK TELEGRAPHERS' ASSOCIATION.

The arrangements for the reception to be held on the 24th of January at Lyric Hall, having been perfected in such a satisfactory manner, by the committee, that the entertainment bids fair to be one of the leading social events of the season; it is expected that nearly all of the leading representative telegraph men will be present: those who have, or can secure tickets (sale of which is limited to 125) may feel assured of a very enjoyable evenfng. As no complimentary tickets will be issued to resident telegraphers, it behooves all to secure them at once. The entertainment is given under the auspices of the following named gentlemen:

A. H. WATSON, Prest. J. H. DWIGHT, Vice Prest.
J. A. ASHHURST, Secy. A. S. DOWNER, "
J. W. BALDWIN, Treas. W. K. APPLEBAUGH, "

—o—

EXECUTIVE COMMMITEE.

W. J. HOLMES,	J. D. REID,
E. F. LUDWIG,	W. J. DEALY,
J. O. GREEN,	M. H. READING,
JOHN J. KIERNAN,	S. H. EDWARDS,
T. G. SINGLETON,	E. A. LESLIE,
D. W. MCANENY,	E. H. KEARNEY.

The Reception and floor committees will be announced hereafter.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
New York, Dec. 15, 1876.

Hon. WILLIAM R. MORRISON,
Chairman, &c.,
New Orleans, La.

SIR: Subpœnas have been served upon several employes of this company, directing them to produce before the Congressional Committee, of which you are chairman, all messages in possession of the company sent and received by the persons named in the subpœnas during several months of the present year.

I have delayed a reply to these demands in the expectation that similar applications would be made by a Committee of the Senate, also charged with the investigation of matters connected with the Presidential election and canvass in several of the States, so that the action of the company, being the same in respect to the messages of both political parties, could not be attributed to a desire to prejudice or promote the interests of either. No subpœnas have yet been served upon us by order of the Senate Committee, and as further delay might appear to be a discourtesy to yourself and your committee, it does not seem proper to further postpone this answer.

The subpœnas were served before the investigation which the Committee had been directed to make was begun, and before evidence had been presented to the Committee either that the persons named in the subpœnas had sent any messages whatever, or that any messages sent by them related to the subject matter of the investagation. It appears to have been assumed that persons, holding high official positions under the Federal and State governments, and others prominent in public affairs, were in the habit of sending messages by telegraph; and without attempting to ascertain if any of these messages were material to the investigation, the officers and agents of this Company have been commanded to lay aside the business in which they are engaged—to become spies and detectives upon, and informers against, the customers who have reposed in us the gravest confidences concerning both their official and their private affairs.

I have never believed that the Congress of the United States, with this subject fairly before them, would permit Committees to violate the secrecy of the telegraph in this manner. And it seems to me that the present is an opportunity which it would be unwise to forego for obtaining a decision directly from the representatives of the people. If the messages of persons connected with one political party are spread before the public, a like course will be taken in respect to those of the other party, Both parties, therefore, have the same interest in publishing to the world the secrets of the telegraph offices, or of preventing such publicity.

It has, therefore, been decided to decline, very respectfully, to permit the employees of this Company to produce before any Committee of either House of Congress messages sent or received by the representatives of either the Democratic or the Republican party, at least until after Congress shall have approved the subpœnas of the Committees and directed that their demands be enforced.

I am, with great respect, etc., etc.
WILLIAM ORTON. *President.*

WESTERN UNION TELEGRAPH COMPANY,
WASHINGTON, D. C., Dec. 18, 1876.

Hon. J. PROCTOR KNOTT, *Chairman Judiciary Committee House of Representatives.*

Sir:—On Saturday last the House of Representatives referred to the Judiciary Committee a communication from Hon. Wm. R. Morrison, New Orleans, Chairman of the House Committee for the investigation of the Election and Canvass in the State of Louisiana and elsewhere, to which was appended a communication which I had addressed to Mr. Morrison, giving reasons why the Western Union Telegraph Company should not be required to furnish the messages of sundry persons named in subpœnas which had been served upon certain employes of the Company.

I regret that the motive of my action in this matter has been misunderstood, and that an impression appears to prevail in some quarters that, for political reasons, I desire to delay and embarrass the investigation which the House has ordered.

I think it due to your Committee, no less than to myself, to make to you the following statement.

While the canvass of the Presidential vote was in progress in several of the States, Dr Norvin Green, a Vice-President of the Company, and my chief assistant, had a consultation with me at my house, to which I had been confined several weeks by illness, at which it was decided that the political messages of both parties sent from and received at stations nearest the headquarters of the two National Committees, to and from Washington, Columbia, S. C., Tallahassee, New Orleans, San Francisco, Portland and Salem Oregon, and several other cities, including relay copies at repeating stations, should be removed from such offices, and forwarded to places of greater security, and with a view to their destruction. Instructions were issued to have this plan promptly carried out, and before any of the subpœnas were issued much of the work had been accomplished. Dr. Green is a well known citizen of Kentucky, who has held prominent positions in that State, and is esteemed wherever known for his high character. The fact that he is and has always been in politics a Democrat should relieve him at least from the imputation that he is seeking to cover up the acts of his political opponents by thwarting an investigation carried on by his political friends. Dr. Green has had the whole charge of this business at all stations south of New York, while I have given the directions at the Western cities and the Pacific coast.

To what extent it would be possible to produce the messages covered by the subpœnaes heretofore issued, I am unable to say, but that the majority have been removed from the sending and receiving stations is undoubtedly true, and equally so that their production would be attended with serious difficulty.

The sole motive for taking the course above described was the protection of the affairs of our customers from public exposure. I distinctly disclaim in my own behalf, as well as on behalf of my business associates, any desire or intention to thwart the work of the Committee of the House, or in any way to show disrespect for its authority. Nor am I disposed to raise the question that telegrams are, under existing laws, privileged communications. Nor that the House has not the power to compel their production. But I submit that the senders of twenty-five millions of messages a year, representing as they do the capital, the enterprise and the intelligence of the country in every department of human affairs have peculiar claims upon Congress for protection from the seizure and search of their private communications, and especially from any use of them which would be liable to intensify political excitement.

It may not be out of place to say in this connection, that no person of either political party has directly or indirectly advised or requested the withholding of messages in this case, and it follows necessarily that no "protection" has been offered or asked for so doing.

I am, with high regard, your obedient servant,
(Signed) WILLIAM ORTON.

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EXECUTIVE OFFICE W. U. TEL. CO.,
NEW YORK, Dec. 23, 1876.

Hon. William R. Morrison, Chairman, New Orleans, La.:

SIR: Accompanying this I send you a communication made by me this day to the Speaker of the House of Representatives in respect to a paper served upon me, and which requires the Sergeant-at-Arms of the House of Representatives to summon me to appear before your committee at New Orleans on the 26th of December. I do not suppose it is thought I possess any personal knowledge concerning any of the matters to be investigated by that committee.

I am but now recovering from a long and serious illness, and my health is in such a state that I could not, without great inconvenience and risks, as well as unnecessary expense to the Government, make so long a journey as that to New Orleans. I trust, therefore, that I may be relieved from personal attendance, and that such report as you may think proper to make to the Speaker of the House, may not involve me in a contempt for a failure to appear personally. I possess no knowledge in respect to any matter confided to you for investigation or in respect to the papers which you seek, which would be of any value to you if I were there. I am, very respectfully,

WILLIAM ORTON.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, Dec. 23, 1876.

To the Hon. Samuel J. Randall, Speaker of the House of Representatives, Washington, D. C.

SIR:—On the 19th day of December a paper (a copy of which is hereto annexed) was handed to me at Washington, addressed to John G. Thompson, Esq., Sergeant-at-Arms, or to his Special Messenger, and signed by you as Speaker, by which paper the said Thompson or his Special Messenger is commanded to produce at New Orleans, before the Special Committee of the House of Representatives, of which Hon. William R. Morrison is Chairman, all telegrams in his possession or under his control, received or sent by William E. Chandler, Zach Chandler, J. Don Cameron, J. M. Edmunds, James Casey, Wm. Pitt Kellogg, S. B. Packard, John F. Casey, J. R. G. Pitkin, Henry C. Dibbel, H. C. Warmouth, George W. Carter, and Gen. Auger, from and at New Orleans, La.; Washington City, D. C., New York City, N. Y., since the first day of September last.

Said paper also appears to require said Thompson to summon me to appear before said select committee at the same time and place, then and there to testify touching matters of inquiry committed to said committee.

Assuming that said paper is erroneously supposed to contain some command addressed to me requiring me to produce before said committee telegrams of a like description in my possession or under my control, I beg leave respectfully to inform you that if any such messages have ever existed, (of which I have no knowledge,) I have never had, either personally or officially, any possession of them; that I have never had any control over them except as an agent of the Western Union Telegraph Company, through and by the co-operation of subordinate agents; that the Western Union Telegraph Company has, without any knowledge or participation on my part, taken from me all power and control over all messages now in the possession of the company. I beg leave, therefore, respectfully, to be excused from compliance with the above-mentioned requirement, it never having been at any time since the service of the subpœna and being not now in my power to comply with the same.

Very respectfully, &c., WILLIAM ORTON.

City and County of New-York, ss.: Personally appeared before me the 23d day of December, 1876. William Orton, to me personally known, who, being duly sworn, deposed that the annexed statement, addressed to the Hon. Samuel J. Randall, Speaker of the House of Representatives, is true, and that the same is made as and for his return to the certain paper purporting to be a subpœna referred to therein.

WILLIAM ARNOUX,
Notary Public,
[SEAL.] City and County of New-York.

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY,
NEW YORK, Dec. 23, 1876.

Hon. O. P. Morton, Chairman of Committee of Privileges and Elections, Washington, D. C.:

SIR:—In response to your notice, dated Washington, December 19, 1876, whereby I am required to produce without delay before the Committee of Privileges and Elections of the United States Senate, originals and copies of all telegraphic dispatches received at, or sent from the telegraph offices at Salem and Portland, State of Oregon, from the first day of November, 1876, to the 19th day of December, 1876, any and all dispatches containing the name of J. N. P. Patrick, or J. N. P. Patrich; also Charles Diamond or Charles Dimond; also Runyon & Co.; also Ladd & Bush; also Eugene Casserly; also William M. Gwinn, or to said Gwinn, or from him, and all dispatches where the sum of $8,000 is mentioned, and all dispatches of a political character by whomsoever sent or received, referring to the Electoral vote of Oregon; the inelegibility of Watts as a Presidential Elector; and also all dispatches of a political character by whomsoever sent or received within the period named herein, I beg leave respectfully to say that I have neither possession nor control of any messages sent by the Western Union Telegraph Company, and am unable, therefore, either to ascertain whether such dispatches or messages as you describe have ever existed, or to comply with the requirements of said notice. Very respectfully,

WILLIAM ORTON.

City and County of New York, ss.: Personally appeared before me this 23d day of December, 1876, William Orton, to me personally known, who, being duly sworn, deposed that the annexed statement, addressed to Hon. O. P. Morton, Chairman of Committee of Privileges and Elections, is true, and that the same is made as and for his return to the notice referred to therein.

[Seal.] WILLIAM ARNOUX,
Notary Public, City and County of New York.

UNITED STATES SENATE CHAMBER,
WASHINGTON, Dec. 19, 1876.

To Hon. William Orton, President of the Western Union Telegraph Company:

You are hereby required to produce without delay before the Committee of Privileges and Elections of the United States Senate originals and copies of all telegraphic dispatches received at or sent from the telegraph office in Salem and Portland, State of Oregon, from the 1st day of November, 1876, to the 19th day of December, 1876, any and all dispatches containing the name of J. N. P. Patrick or J. N. P. Partrich, also Charles Diamond or Charles Dimond, also Eugene Casserly, also William M. Gwinn, or to said Gwinn or from him, and all dispatches where the sum of $8,000 is mentioned, and all dispatches of a political character, by whomsoever sent or received, referring to the Electoral vote of Oregon, the ineligibility of Watts as a Presidential Elector, or to giving the certificate to Cronin as a Presidental Elector, and also all dispatches of a political character by whomsoever sent or received within the period named therein.

O P. MORTON.
Chairman of Committee of Privileges and Elections.

The following resolutions were adopted by the Board of Directors of the Western Union Telegraph Company at a meeting held Dec. 22, 1876:

Resolved, That the Western Union Telegraph Company regards itself as the confidential agent of such of the people of the United States as may wish to employ its agencies for the transmission of communications by telegraph, and bound to resist by every lawful means all publications or examination of its records.

Resolved, That, excepting such messages as may be directed by the sender to be preserved for a period not exceeding six months, the Executive Committee is hereby directed to provide in the future for such speedy destruction of all written messages as the necessary keeping of accounts between the respective offices of the company will allow.

Resolved, That the Board of Directors hereby approve the action of the Executive Committee in removing all messages now on hand from the control or possession of any of its officers.

THE SECRECY OF THE TELEGRAPH.

Whether a party leader, on one side or the other, has sent to any Southern State a telegram which it would be discreditable to him to have made public, is a very small matter compared with the importance of preserving the right of persons to communicate with each other confidentially, and without a liability to have their communications exposed, unnecessarily, to those for whom they are not intended.

A few everlasting principles lie at the foundation of a free Government. They should compose its principal superstructure, and among these none is more sacred than "the right of the people to be secure in their persons, houses, papers, and effects against unreasonable searches and seizures;" a right which the Constitution of the United States declares "shall not be violated." We must be careful that we do not, in order to keep the Government running, destroy one of the most precious privileges—the privilege of the private interchange of thought—which it is designed to maintain.

In the progress of science and invention the telegraph has become a principle medium of communication on the most important and pressing matters, whether political, commercial or social. We think what goes over the wires should be sacred, and that other sources of information and of evidence should be resorted to for the establishment of charges of fraud and crime.

This is a matter of general interest. It may be be said with almost literal truth that the whole world is interested in preserving the secrecy of the telegraph. The idea that every curious and prying legislative committee may cause to be spread before the public everything that has been sent over the wires will be hateful and repulsive to the people in general and we believe the ultimate decision will be against any such exercise of arbitrary power.—*N. Y. Sun.*

The letters of President Orton, printed elsewhere, furnish fresh proof of the resolute spirit in which the Western Union Telegraph Company meets the demand of the House of Representatives. This is a contest in which every citizen who uses the telegraph or post-office is vitally interested, for if the privacy of the one is invaded the sanctity of the other may be violated. Every citizen who would not see another added to the list of crimes committed against the people in the name of the people should throw his influence against the wicked attempt of their misguided representatives to destroy a valued right for the sake of a temporary partisan purpose.—*New York Tribune.*

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ON THE POINTS OF CONTACT BETWEEN MAGNETISM AND LIGHT.

From The Telegraphic Journal.

Of all physical investigations, perhaps the most important at the present day is the discovery of definite relationships between the phenomena of electricity and magnetism and those of light. Our readers are doubtless aware of the critical theoretical issues which depend upon the precise determination of this relationship. When corresponding electrostatic and electro-magnetic phenomena are numerically compared, it is well known that the latter are larger than the former, and the number of electrostatic units in one electro-magnetic unit is found to vary inversely as the magnitude of the unit of length, and directly as the magnitude of the unit of time adopted. Hence, the ratio of the two units is expressed by a length divided by a time: but space divided by time expresses velocity, and the conclusion is therefore obvious that the relationship between these two sets of phenomena is really a definite velocity—a natural quantity, in fact, the magnitude of which can be determined. Now, the measurement of this quantity is, as Prof. Clerk Maxwell has said, one of the most important researches in electricity. We are not, however, left in doubt as to the value of this ratio, for it has been measured by Weber and Kohlrausch, Thomson and Maxwell, and the extremely important fact has thus been revealed that the ratio of the two sets of units is a quantity of the same order of magnitude as the velocity of light. Neither of these constants has yet been determined with such accuracy as to enable us to say that one is greater or less than the other. Thus, the velocity of light, determined by Fizeau, is 314,000,000 metres per second, and as determined by Foucault, 298,360,000; the ratio of the electric units determined by Weber is 310,740,000, and by Maxwell, 288,000,000 metres per second. Thus, we have strong reasons for believing "that light is an electro-magnetic phenomenon," * and therefore it is more than probable, as Faraday long since suggested, that if a material medium fills space, it has other functions besides the conveyance of luminous and calorific radiations. In fine, the ether, which the undulatory hypothesis of light compels us to assume, is the electro-magnetic as well as the luminiferous medium—for the properties of the two media are identical—and thus a very weighty confirmation has been obtained of the real existence of this universally-diffused and transcendently-subtle form of matter.

The meaning of the first sentence in this article will now be more apparent, and the question we have to ask ourselves is, what points of contact have as yet been experimentally found between electricity and magnetism on the one hand, and light on the other; and what is the nature of such relationships, if any?

Passing over the doubtful experiments of Morrichini, Christie, and Somerville, on the influence of the solar rays on needles magnets, we come to Faraday's great discovery, termed by him "the magnetisation of light," but which would be more correctly expressed as the effect of magnetic force in turning the plane of polarization of light transmitted through diamagnetic substances. This discovery Faraday made in September, 1845, and it forms the 19th series of his "Experimental Researches.

Those famous words, spoken by Macbeth, seem specially applicable to Faraday, and his spirit of courageous investigation:—

> "'Tis much he dares:
> And to that dauntless temper of his mind.
> He hath a wisdom that doth guide his valor
> To act in safety."

He tells us he was led to the discovery by the conviction "that all the forces of nature are mutually dependent, having one common origin." Just as the intrepid explorer of some unknown region is guided by a prevailing idea, so Faraday, through all his work, was fascinated by this dominant impression, that the energies in Nature were one in essence, though different in manifestation. Not disheartened by repeated failures, he at last transmitted a ray of plane-polarized light through a transparent diamagnetic medium (the first substance tried being heavy glass, which he had long previously made for his optical experiments), and as the light emerged from the substance, the plane of polarisation was observed by noting the position of the analyzer when it cuts off the ray. A powerful magnetic force was then made to act, so that the lines of force within the substance coincided with the direction of the ray. Faraday thus found that the effect of magnetic force was to turn the plane of polarisation through a small angle, round the direction of the ray as an axis. The direction in which the ray has thus been turned is the same as the direction of the positive current in the electro-magnet. This is the case for diamagnetic media; for certain salts of iron the direction of rotation has been found to be the reverse of the foregoing.

Now there are certain substances, such as solution of sugar, turpentine, &c., which independently of magnetic force rotate the plane of polarization as the ray passes through the substance. There is this radical difference, however, between such natural rotation and that induced by magnetic action—viz., in the former case the direction of rotation is reversed when the direction of the ray is reversed, and in the latter case the direction of rotation is exactly the same whichever way the ray passes along the substance, the direction of rotation only being reversed by reversing the magnetic poles. If it were possible to reflect the ray to and fro along the diamagnetic body, the amount of rotation would therefore be increased in direct proportion to the number of times the ray traversed the body.

The physical explanation of the phenomenon discovered by Faraday is given by Professor Clerk Maxwell in his wonderful treatise on "Electricity and Magnetism." Our space will only allow us to make the following extract, in which Prof. Maxwell expresses the phenomenon of rotation, and which is independent of any theory of light. "A plane-polarized ray falls on the medium. This is equivalent to two circularly-polarised rays, one right-handed, the other left-handed, as regards the observer. After passing through the medium the ray is still plane-polarized, but the plane of polarization is turned, say, to the right (as regards the observer.) Hence, of the two circularly-polarized rays, that which is right-handed must have had its phase accelerated with respect to the other during its passage through the medium. In other words, the right-handed ray has performed a greater number of vibrations, and therefore has a smaller wave-length within the medium, than the left-handed ray, which has the same periodic time." In fact, the index of refraction of the glass for one of the circularly-polarised rays is altered by the act of magnetization.

It is clear the relationship between light and magnetism discovered by Faraday is molecular phenomenon; the heavy glass is a diamagnetic body, and tends to place itself across the magnetic field, but being constrained to occupy an axial position, its molecules are thrown into a state of strain which is revealed by polarized light.

Prof. George Forbes has shown * that the same effect as that discovered by Faraday might be produced without the aid of magnetism, if the rod of heavy glass were rotated round the axis of the ray of light with great velocity. The rotation of the plane of polarization would be the angle rotated whilst the ray traverses the glass rod. This is on the assumption that the ether within the rod is likewise rotated. But to produce by rotation an effect corresponding to the magnetic effect, the glass rod would have to be rotated ten million times a second, and this is beyond the range of experiment. Further, Prof. Forbes points out that supposing the molecules of the glass and the accompanying ether to be rotated round the lines of magnetic force, in the direction of the positive current producing the given magnetic field, then the phenomenon discovered by Faraday would be explained. So soon as the electro-magnet is demagnetized, the rotation of the molecules ceases. It seems, then, Prof. Forbes thinks, there is a friction among the molecules tending to stop the rotation, and if this be so, it follows that when the electro-magnet is excited, the rod of glass will have a tendency to turn bodily round an axis through its centre of gravity, and parallel to the lines of force, and if the rod be free to move, such a rotation ought to be observed. Prof. G. Forbes has put his ingenious hypothesis to the test; and though his investigation is as yet incomplete, the results of his experiments hitherto have shown that there is an effect of the kind anticipated. The nature of the deflection was found to depend on the polarity of the magnet, and by timing the reversals of the current a considerable amplitude of rotation was obtained.

Prof. Maxwell has added a valuable note to Prof. Forbes' paper, pointing out, as he had already done in his work on Electricity, "that there can be no doubt a rotation of some kind is going on in a diamagnetic medium under magnetic force. and this may be of the molecules, of the glass, of the ether, or what not, and this probably goes on in all media, whether transparent or not." Prof. Maxwell, however, objects to the assumption that this rotation is stopped by inter-molecular friction as soon as the magnetic force is removed, inasmuch as it has never been shown that a magnet must necessarily lose its magnetism. "Hence we must admit," Professor Maxwell adds, "that the molecular rotation is not accompanied by friction, but that it is set up by electro-motive force when it is stopped, like a rotating body having inertia." Prof. Maxwell then indicates how the points suggested by Prof. Forbes may be investigated experimentally.

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* "Maxwell's Electricity and Magnetism," vol. ii., chap. 20.

* Proc. Royal Soc. Ed., vol. ix., No. 94, p. 85.

The traffic receidts of the Great Northern Telegraph Company for October, were 548,647 francs, against 386,659 for the corresponding month last year. Total, January to October, 4,162,322 francs against 3,509,746 francs for the corresponding months of last year.

The traffic receipts of the Direct Spanish Telegraph Company, for October, were £781, against £1, 580, for the corresponding month last year.

The number of messages transmitted for the month of October by the Cuba Submarine Telegraph Company, was 2,113, estimated to produce £1,303 against 2.372 messages, producing £1,977, in the corresponding month last year.

The receipts of the West Coast America Telegraph Company, for four weeks ending 26 August, were $2,449.

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INFLUENCE OF TEMPERATURE ON THE GALVANIC CONDUCTIVITY OF TELLURIUM.

Conductors of the galvanic current have been divided into two classes, those which do and those which do not undergo a chemical change in the process of conduction. The latter (*e.g.*, metals) have, in general, their conductivity diminished by rise of temperature. The former (*e.g.*, all decomposable liquids) have it increased.

Tellurium and selenium form a remarkable exception, in that their conductivity is, at least within certain limits, increased by heating. The researches of Dr. Siemens on selenium have formerly been described in these columns. The behaviour of tellurium has been experimentally investigated by M. Franz Exner (*Pogg. Ann.*), with results which we shall here briefly record.

Three bars of tellurium were prepared, pulverized tellurium being fused in glass tubes, then allowed to cool in air. (In some cases the tubes cracked; tellurium, like bismuth, expands in passing into the solid state.) Bar I. broke before its dimensions were determined. Bar II. was 54mm. in length, and 2·6mm. in diameter. Bar III. was 153mm. in length, and 3·73mm. in diameter. The heating was done in an air-bath, and the resistance was measured at intervals with a Siemens universal galvanometer. The phenomena were as follows:—

Bar I. was heated from the temperature of the room to about 200° C, then slowly cooled. There was an increase of the resistance up to 90°, then a gradual decrease to 200°. But in cooling, the turning point at 90° was not perceptible; the resistance increased from 200° continuously to the room-temperature; and so strongly, that the resistance at the end of the experiment was six times as great as that at the same temperature at the beginning of the experiment.

The same bar was again heated from 22° to 200°. There was now no turning point; the resistance decreased continously on to the highest temperature, and increased continuously throughout in the cooling. At the end, however, the resistance was less than at the beginning of the experiment. In a third experiment, the turning point was again wanting, but at the end the resistance was again increased; and in a fourth experiment the same was again diminished. On the other hand, at the maximum temperature of 200°, the resistance was in all four cases pretty much the same.

The second bar also gave a turning point in the first experiment, but this was considerably higher, viz., at 140°. In cooling, it showed a regular increase of the resis ance, which finally was four times as great as at the beginning, at the same temperature. Several repetitions showed a behavior not essentially different from that of Bar I.

With Bar III. five series of experements were made, and with quite similar results. With the first heating there was a turning point, which did not appear with after heatings. At the maximum temperature, the resistance was pretty constant, while the resistances at the beginning and end of the experiments were very irregular.

Two questions call for answer:—Why has tellurium, being a metal, a less resistance at a higher temperature than at a lower? and why has this resistance not a constant value for each temperature?

It soon appeared that the final resistance depended on the velocity of cooling. The duration of the heating to 200°, did not affect either the value of the resistance at 200°, or that obtained at the end of the cooling. The duration of cooling, however, determined the final resistance; which was less the more rapid the cooling. The molecular state after cooling seems to depend essentially on the duration of cooling.

"Considering also the circumstance," says M Exner, "that tellurium at ordinary temperature has a strongly crystalline structure, there can hardly be a doubt that all the abnormal phenomena depend on the molecular character in each case; they are also fully explained if we suppose that tellurinm conducts worse, the more pronounced its crystilline structure; a supposition which *a priori* has nothing in it improbable. If we make this hypothesis, then *two factors* must be taken into account, as determining the resistance—first, the change of molecular state; and second, the direct change of temperature." He then points ont that the crystal surfaces and planes of clevage probably increase the resistance, and that circumstances preventing or destroying crystallization (such as heating) must diminish the resistance. Heating also acts by causing a more intimate contact of the crystalline particles through expansion. Quick cooling must diminish the resistance, for it hinders the crystallization; slow cooling has the opposite effect. Immediately after solidifying from the infused state (which process was rapid), the tellurium bars had a less crystalline structure than after the slow coolling from 200°, and their resistance was then very small. Compare also the fact of the turning point; where the crystallisation is but little, the influence of heating only becomes perceptible at the higher temperatures. At the lower, the influence of heating predominates in the direction of an increase of the resistance. Thus the direct influence of heating on tellurium acts in the same direction as in all other conductors of the second class, and the abnormal phenomena are only a consequence of secondary processes, molecular changes of structure.

FIRE ALARM TELEGRAPH.

A NEW SYSTEM TO BE INTRODUCED IN BALTIMORE.

The Mayor, City Register, and City Comptroller of Baltimore have awarded the contract for the construction of a new and improved system of a fire alarm telegraph to Gamewell & Co., of New York, at the price bid by the firm last week, being $55,000, precisely the amount appropriated for the work by the last City Council. There were several bids lower than that of Gamewell & Co., but none of the latter had any established lines. The commission, consisting of the city officers above named, based their decision on the report of Mr. J. Frank Morrison, Superintendent of the Police and Fire Alarm Telegraph, who recommended that the contract be given to Gamewell & Co. as being the only firm that has made the system of fire alarm telegraph a specialty.

The report also gives recommendations of the Gamewell system by superintendents of telegraph companies and by the General Superintendent of the Western Union Telegraph Company in New York.

The new system will embrace 150 boxes, 2,500 chestnut poles, 170 miles of wire, together with automatic repeaters, dial repeaters, keys, and all the paraphernalia of a first-class equipment. There will be sixty-eight more boxes than at present, twenty of which will be placed at engine and station houses. By the new system the city will be divided into twenty-five circuits instead of into five, as at present, and thus, when communication with the central office is broken off by some accident with any section of the city, the alarm will pass through any one of the other circuits. At present when by accident a portion of one of the wires gives way that locality has no direct communication with the central office; and in case of fire no alarm from that section can be received at the latter office, from which the alarms are re-sent from he different engine and station houses.

MORE TELEGRAPHIC FACILITIES.

The Western Union Telegraph Company have just completed the erection of a fourth wire between Reno, Nevada, and Salt Lake. This wire is No. 6, the largest guage used for telegraphing, and is intended for the use of the quadruplex instrument, whereby four messages can be sent over the same wire simultaneously. The length of this wire is about 600 miles. This section of the Company's line has also been entirely reinsulated, and all pine poles taken out and replaced by redwood, making this one of the most substantial and best pieces of telegraph lines in the United States. The Company has expended about $70,000 on this section alone this year. To meet the growing business of the Company on the Pacific Coast over 1,500 miles of new lines have been put up this year, at a cost of nearly $200,000. Telegraphs are not like railroads that merely have to hitch on more cars to carry the increased traffic, but when he capacity of a wire is reached a new one must be put up, and extra operators employed to work it, and for this reason the Company claim that rates cannot be greatly reduced without a loss in profits.

The new wire was completed just in time to enable us to get the President's message through in time for yesterday's *Bulletin*, but about three hours being required for its transmission from Washington, a distance of about 3,500 miles, a feat which does great credit to the Company and expresses better than any thing else can the great facilities it now possesses for the transmission of messages. *Bulletin, San Francisco.*

THE PROMOTION OF GEN. STAGER.

The promotion of Gen. Anson Stager to the Vice-Presidency of the Western Union Telegraph Company has been received with commendations from the press generally, and appears to afford much satisfaction to all associated with him in the service of the company. The distinguished ability which he has exhibited during his long connection with the telegraph service, in which he has risen from the lowest to the highest positions, and his popularity with the public and with the employés, have made him very valuable to any telegraph company. He has grown up with the Western Union Company, and has been diligent and faithful in its service, and well deserves all the honors that can be bestowed upon him.

We congratulate him heartily upon this renewed evidence of appreciation upon the part of the directors of the company, and the company as well upon its good fortune in securing and retaining him in its service.—*The Telegrapher.*

The election of General Anson Stager, general superintendent of the central division of the Western Union Telegraph company, to the vice-presidency of that corporation, is a promotion which is deserved and which will gratify all the friends of that able and faithful official. General Stager has been connected with the telegraph business almost from the beginning, and no man understands it better. His remarkable executive powers will now have a wide field in which to operate, and it is safe to say the result will be the same efficiency and thoroughness of administration that have characterized his work in whatever place he has held. It is a great misfortune public life offers no attractions that will draw men like Gen. Stager into it. The best brains of a country should be in its government, but with us they in its business.—*Indianapolis Daily News.*

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TARIFF BUREAU.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAP COMPVNY,
New York, January 1, 1877.

To all offices on Western Union Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

On and after January 1st, 1877, the "tariff for other lines" (New York City and Boston to Montreal excepted) on messages between Western Union offices in the United States and offices in Canada including all other line offices in New Brunswick (except Bay Verte, Cape Tormentine, Buctouche, Kingston, K. Co., and Richibucto) will be 25 and 2.

285 Wilhites, Ala., reopened.
Cisco, Cal., reopened.
Downey City, Cal., is now an other line office 30 10† Los Angeles.
Gilroy Hot Springs, Cal., closed.
Glenbrook, Lake Co., Cal., closed.
Litton Springs, Cal., closed.
Maine Prairie, Cal., reopened.
* Sulphur Creek, Cal., closed.
Tulare, Cal., is now an other line office 75 35† Bakersfield.
* Laveta, Col., closed.
The P. O. A. of Winsted, Conn., is now same as the name of the office.
There is now a W. Union office at West Winsted, Conn., square 32. Check direct.
Hereafter the "tariff for other lines" from Lake City, Fla., to the following offices on other lines will be:

Archer, Fla.,	100 8	Green Cove Springs, Fla.,	50 3
Baldwin, Fla.,	50 3	Jacksonville, Fla,	50 3
Bronson, Fla.,	110 8	Micanopy, Fla.,	50 3
Callahan, Fla.,	75 6	Newnansville, Fla.,	50 3
Cedar Keys, Fla.,	125 8	Starke, Fla.,	75 6
Fernandina. Fla.,	100 8	Waldo, Fla.,	85 6
Gainesville, Fla.,	50 3		

Allendale, Ill., closed.
Messages taken for Iowa State Normal School near Cedar Falls, Iowa, are delivered from Cedar Falls. Charges for delivery fifty cents, and for Insane Asylum, near Independence, Iowa, one dollar, delivery from Independence.
Messages accepted for Prattville and Revere, Mass., are delivered from Chelsea. Charges for delivery fifty cents to each.
Winthrop, Mass., one dollar delivery from East Boston.
Rock Falls, Mich., closed.
Grand Island, Kearney Junction, North Platte, Ogallalla and Sydney, Neb., will hereafter be half rate offices.
Fullionville, Nev., closed.
Summit, Nev., closed.
Suncook, N. H., is now a W. U. office. Square 24, check direct.
Dexter City, Ohio, reopened.
Cumminsville, O., is a W. Union Office in square 233, and should be checked direct.
Pontiac, O., closed.
* Collins Bay, Ont., closed.
* Wellington Square, Ont., changed to Burlington.
159 Clinton, Lawrence Co., Pa., reopened.
Hellertown, Pa., closed.
Burning Springs, W. Va., closed.
Buckhannon W. Va., closed.
Clarksburg, W. Va., closed.
Elizabeth, W. Va., closed.

NEW OFFICES.

* Cabazon, Cal. 58 29† Los Angeles.
Feeney's Ranch, Cal.
Piedmont, Cal.
Santa Paula, Cal.
Tyrone Mills, Cal.
251 Pleasant Lake, Ind.
416 Judd, Iowa.
14 South Windham, Me.
20 Steep Falls, Me.,
* Chazy, N. Y., (Montreal Co.,) 30 2 Oswego, 25 1 Whitehall or Montreal Junction.
64 Forestport, N. Y.
41 High Bridge, N. Y.
59 Camden, N. J. Abattoir.
* Burlington, Ont., formerly Wellington Square.
Brewster Valley, Oregon.
Empire City, Oregon.
Fairview, Oregon.
Marshall, Oregon.
330 Henry, Tenn.
35 Bristol, Vt.
27 McIndoes Falls, Vt.
Lewis River, Washn. Terr.
316 Genoa Junction, Wis.

ATLANTIC CABLE.

The words *via* Falmouth, *via* Teheran, *via* Siberia or other indications of routes in cable messages to places beyond France will hereafter be accepted, and forwarded free of charge from the sending office to destination. To insure the free transmission of the words referred to they should be written and appear only in the check.

We are notified that in consequence of the interruption of the Vigo Lisbon cable, messages for Gibralter, Portugal and South America will until further notice be forwarded via Malta, an extra charge of twenty cents per word in addition to the present rates beyond London must be collected.

The Australian land lines between Port Darwin and Adelaide are interrupted. Messages for Australia and New Zealand will, until the lines are repaired, be subjected to some delay.

CUBA CABLE.

We are notified that messages written in Code or Cipher are prohibited to and from offices in Cuba. This does not apply to messages to and from points beyond Cuba.

WILLIAM ORTON,
President.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENTS 89 and 90, December 30, 1876.

Death of JESSIE B. MELLOR and J. HENRY ROGERS.

Jesse B. Mellor died of consumption at Pittsburg, Pa., Nov. 18, 1876, his certificate, No. 1105, was issued March 13, 1871.

J. Henry Rogers died of consumption at Ogdensburg, N. Y., Nov. 28, 1876; his certificate, No. 1232, was issued Sept. 5, 1871.

Two dollars are due for assessments 89 and 90 from members certificates up to and including No. 2795; one dollar is due for assessment No. 90 from members holding certificates numbered from 2795 to and including 2811. Members who have not remitted for assessments of Sept. 1st, Nos. 87 and 88, will please consider this a duplicate notice that assessments are due and should be paid at once.

RECEIPT OF ASSESSMENTS.

NEW YORK, December 23, 1876.

ASSESSMENT No. 86.

2418.

ASSESSMENT No. 87.

1278, 2633.

ASSESSMENT No. 88.

17, 22, 31, 85, 86, 87, 438, 490, 503, 601, 695, 697, 705, 931, 1071, 1141, 1155, 1157, 1160, 1207, 1267, 1284, 1400, 1556, 1557, 1570, 1609, 1613, 1670, 1704, 1744, 1847, 1945, 1946, 1947, 1987, 2086, 2128, 2132, 2147, 2151, 2236, 2279, 2280, 2281, 2282, 2283, 2352, 2448, 2552, 2594, 2595, 2603, 2684, 2738.

ASSESSMENT No. 89.

64, 138, 182, 217, 235, 286, 319, 333, 509, 552, 592, 943, 1077, 1092, 1153, 1157, 1678, 1742, 1852, 2275, 2319, 2430, 2495, 2525 2558, 2607, 2720, 2722, 2723, 2725, 2726, 2727, 2728, 2730, 2734, 2735, 2736, 2737, 2738, 2758, 2760, 2780, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2805, 2806, 2807, 2808, 2809, 2810

ASSESSMENT No. 90

121, 131, 208, 211, 262, 277, 289, 302, 312, 564, 615, 709, 742 799, 832, 874, 915, 976, 1154, 1199, 1357, 1407, 1503, 1516, 1524 1527, 1601, 1656, 1840, 1862, 1938, 2026, 2033, 2066, 2103, 2240 2270, 2305, 2346, 2363, 2690, 2724, 2780, 2811, 2812, 2813, 2814 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2323, 2924, 2325 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2333, 2384, 2335, 2333 2837, 2838, 2839, 2840, 2841, 2842.

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WESTERN AND BRAZILIAN TELEGRAPH.

An extraordinary general meeting was held on Wednesday at the City Terminus Hotel; Mr. H. Rawson, a director, in the chair, to consider the resolutions passed at the meeting on the 9th.

The Chairman, in opening the proceedings, regretted the absence of Mr. Heugh. At the last meeting Mr. Quilter asked whether he and Mr. Heugh had properly carried out the arrangements entered into. There was some mistake in the matter. He did state that Mr. Heugh and himself in conjunction with the board, had made arrangements to the extent of £40,000 to meet the pressing engagement of the company, and not that Mr. Heugh and he had taken on their shoulders the whole £40,000. He was glad to state that all those engagements which were pressing had been paid. They owed no money to any of their sister telegraph companies, nor to their tradesmen, excepting expenditure incurred within the last month or six weeks. They were entirely out of debt, excepting the money raised by the directors to meet those engagements. The amount which the shareholders were asked to vote that day was £500,000. With regard to the 300,000 for the Platino-Braziliera Company, they proposed to pass a resolution authorizing the £300,000 to be raised, but they also proposed to submit a resolution that it should not be raised, nor any agreement made with the Plantino-Braziliera Company which should not hereafter be submitted to the shareholders before the amount was confirmed. As to the balance of £200,000, he would not give an opinion as to how much of it would be required. He hoped the whole of it would not be, but the cables were at the bottom of the sea. As regarded one section, from Pernambuco to Para, a large sum would have to be expended on it; but the concession was given on certain conditions, and it was only right that they should carry out that concession and keep the cables in repair. The concession, he believed, was very valuable, and he believed it was to the interest of every shareholder of the Company to find his portion of money for that purpose. He desired to make one remark as to the usual mode in which these companies had been conducted. He believed the cables had been purchased not by cash, but by debentures, or shares, or anything but the "pure material." The shareholders must be aware that cables could not be purchased on favorable terms in such circumstances, and he should like to see all they did for the future done with cash on the best possible terms. He also believed that a large saving might be made in expenses—indeed, some saving had been made. There was one alteration in the first resolution. The directors proposed taking out the words "having not less than fifty years to run" in relation to the debentures, and they asked the shareholders to leave the matter in the hands of the directors.

The Solicitor then read the resolutions which were passed at the meeting on the 9th ult., with the alteration, and the Chairman then moved their confirmation.

The motion having been seconded, Mr. Ford moved, as an amendment, the adjournment of the meeting till after the balance-sheet for the year ended the 30th of September, 1876, was in the hands of the shareholders. He considered the application of the directors for the powers asked for was premature, and if the shareholders sanctioned it, he said, the value of their share capital would be effaced from the Stock Exchange. He then contended that it was not expedient to issue mortgage debenture stock, and argued in favor of issuing preference shares.

The Chairman, in reply to one of the remarks of Mr. Ford, repudiated the circular issued on the 23rd September by Mr. Heugh, the late chairman of the company.

Mr. Quilter seconded the amendment, and appealed to the directors not to hurry into the proposals suggested.

After a few remarks from Mr. Abbott, who acquiesced in the observations of Messrs. Ford and Quilter,

The Chairman stated that the directors had fully considered the course they should adopt in regard to the issue of the stock, and he had heard no reasons which could change their views. In Mr. Heugh's absence he would make no observations with regard to him or to the difference between himself and Mr. Heugh as to the past conduct of the company. He thought it likely that they would not come to an agreement with the Platino-Braziliera Company, and therefore they might put the sum of £300,000 aside. If they deferred the meeting no further information could be furnished. The money must be raised, and no one attempted to dispute this. The only question was as to the mode in which it should be raised. If they raised it on preference shares they would have to pay a higher interest than they would pay on mortgage debenture stock, and if the shareholders would not take up the latter he did not see how they would take up the former.

After some further discussion, the original motion, confirming the resolutions, was carried.

TELEGRAPH SECURITIES.

The feature of the month has been the advance of no less than 40 per cent. in the ordinary shares of the West Indian and Panama Company, and of 3 per cent. in the preference shares. It may be remembered that, in my two last circulars, I directed special attention to these securities as possessing the seeds of latent vitality, and as being exceptionally depressed. Those who have followed my recommendation may be congratulated on the result, and I think the shares still offer a fair opportunity for a further important advance. Anglo-American stock has been subjected to fluctuations consequent upon rumors circulated by interested parties that the negotiations with the Direct Company for a joint purse arrangement have fallen through. I am in a position to state that there is no foundation whatever for any such rumours. They, however, in some instances answer the purpose for which they are circulated—that of frightening the holders out of their stocks; and as I have no sympathy with these market manipulations, I have no hesitation in advising *bona fide* holders not to be influenced by such unscrupulous tactics. The shares of the Eastern, the Eastern Extension, and the Brazilian Submarine Companies have also improved during the past month consequent upon steady investment purchases attracted by the high interest yielded at the present current quotations. As regards the Eastern and Extension Companies, confidence is supported by the knowledge of the fact that the duplicate lines now being laid by the Telegraph Construction Company ensures both these companies from the chance of future interruption. The Western and Brazilian Company forms an exception to the general prosperity of telegraph property, this system seems to have drifted into a state of chaos, both as to its finances and the working of its lines, from which extrication will be hopeless until the whole undertaking is placed under the control and management of men of sound practical telegraphic experience. I would suggest in the case of this company that the proprietors should adopt the healthy principle of an exchange of their investment in this undertaking, and reinvesting in the ordinary shares of the West India and Panama Telegraph Company. The latter is just emerging from its difficulties, while the Western and Brazilian Company is about to enter upon them. One hundred shares in the Western and Brazilian Company, if now sold, would produce more than sufficient to purchase 250 West India and Panama Ordinary shares. A rise of 10s. per share in the latter would be equal to an advance of 25s. in the former. The Telegraph Construction and Maintenance Company continues its career of uninterrupted prosperity; it is therefore not surprising that its shares are steadily advancing, notwithstanding the persistent efforts to depress them by those who know nothing of the merits of the undertaking. The 1,200 wealthy proprietors of this company are too well satisfied with the property they possess to part with their shares upon the eve of a dividend which cannot fail to be highly satisfactory. It is not alone the handsome profits known to be made in the current financial year, which explains the stability of the quotation, but the knowledge that the contracts in hand are sufficient to yield very satisfactory results for the two succeeding years. It is a remarkable fact, and one which has not escaped the attention of the proprietors of the Telegraph Construction Company, that the shares of the various submarine companies, whose cables have been manufactured by this company, are the only ones which are now in especial favor with investors.—*From the Circular of Mr. William Abbott.*

The Santiago-Jamaica cable has been repaired thus reestablishing telegraphic communication with the West Indies.

The Colony of Queensland has 4,609 miles of telegraphic lines, the mileage of the wires being 6,058.

The female staff of the Edinburgh, Scotland, telegraph office, are, it is understood, to have a separate apartment provided for their occupation in January next.

In less than twenty-five years India has been covered with a network of telegraph wires extending to some 35,000 miles.

INFLUENCE OF TEMPERATURE ON MAGNETIZATION.

BY M. GAUGAIN.

In two bars of the same nature, same section, and different lengths, the co-efficients of temporary variation corresponding to points similarly placed (middle points, *e.g.*), increase with the length of the bar. These co-efficients vary much, even in similar bars from the same works. The co-effcients of permanent and temporary variation are less in iron than in steel. To determine the influence of temperature, it is necessary that this be invariable during each experiment. M. Gaugain proceeds thus:—He takes a bar of steel puts it in contact, at ordinary temperature, with one pole of a permanent magnet, and determines the value of total magnetization for a certain point, M, of the bar. Then he demagnetizes the bar, raising it to a cherry-red temperature, when it has cooled, he heats it with a sprit lamp, so as to bring it to about 300°; only then does he put it in contact with the magnet, and without allowing it time to cool again, measures once more the total magnetism at M. It is found that if the bar is capable of considerable temporary variation, the magnetism developed is weaker at 300° than at ordinary temperature. But when the temporary variation is very small, the magnetism is greater at 300° than at ordinary temperature. If we correct the values of magnetism obtained at different temperatures, so as eliminate the effect of temporary variation, it is found that for both bars the corrected magnetism increases with the temperature,

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The sixth report of the Trans-Andean Telegrph Company gives interesting data as to the condition of the Argentine and Chilian land telegraph system at the close of 1875. This system is divided between the Argentine and Chilian sections. In the last six months of 1875 the number of messages on the Chilian section was 9,784, of which 1,608 were internal tional; on the Argentine section 16,720, of which 1,554 were international. These figures are irrespective of 5,688 government messages transmitted.

WESTERN UNION TELEGRAPH COMPANY,
TREASURER'S OFFICE,
NEW YORK, December 13, 1876.

DIVIDEND No. 38.—THIS COMPANY HAS declared a QUARTERLY DIVIDEND OF ONE AND ONE HALF PER CENT. on the capital stock of the company, from the net earnings of the three months ending Dec. 31, instant, payable at the office of the Treasurer, on and after the 15th day of January next, to shareholders of record on the 20th day of December.

The transfer books will be closed at 3 o'clock on the after noon of the 20th instant, and opened on the morning of the 16th of January.

R. H. ROCHESTER, Treasurer.

AMERICAN LINE.

Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

Every Thursday from Phila. and Wednesday from Liverpool.

The only Trans-Atlantic Line sailing under

THE AMERICAN FLAG

The only steamships carrying Life Rafts.

The following Steamers are appointed to sail from Philadelphia:

OHIO	Dec. 14	INDIANA	Jan. 4
PENNSYLVANIA	Dec. 21	ILLINOIS	Jan. 11
*CITY OF NEW YORK	Dec. 28	*LORD CLIVE	Jan. 18

RATES OF PASSAGE IN CURRENCY, SALOON, $75 to $100.

Round trip tickets on very favorable terms.

Intermediate passage, - - $40 Steerage, - - - $28

Return-trip tickets by the American Line are good, if the passenger so desires, to return by the Red Star Line from Antwerp, by which the expense and annoyance of re-crossing the Channel can be saved.

For other information, apply to

PETER WRIGHT & SONS, General Agents, 307 Walnut Street, Philadelphia.

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Red Star Line.

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia.		From New York.	
VADERLAND	Dec. 29	SWITZERLAND	Jan. 10
NEDERLAND	Jan. 22	KENILWORTH	Feb. 3

RATES OF PASSAGE IN CURRENCY.

First Cabin, - $90. Second Cabin, - $60. Steerage, - $26

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GENTS' SOLID GOLD PINS beautifully made, all the screws and small parts of the Morse Key is represented, ¼ of an inch long, is heavy and nicely finished, $5.00.

LADIES' SOLID GOLD PINS.—Smaller than the above, beautifully finished with Green and Yellow Gold, $4.50.

Sent by registered letter or Express on receipt of price.

M. A. BUELL & SONS,

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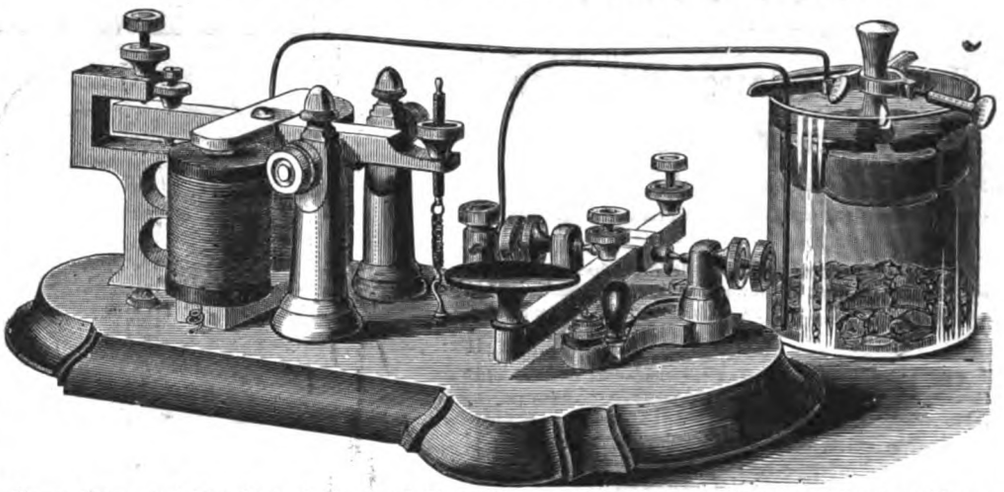
Bunnell's Learners' Instrument Perfected.



Complete and Perfect, full-sized Sounder and Key, with Book of Instruction, Battery, Wire, and all necessary Materials.

[These instruments have been greatly improved in their working qualities and in the style in which they are finished. Those having the latest improvement in their construction are those manufactured *only* by Messrs. L. G. TILLOTSON & CO.
JESSE H. BUNNELL.]

They are made in the best manner, and are just exactly the thing wanted for

LEARNERS' USES, FOR TELEGRAPH SCHOOLS, or FOR SHORT LINES, from a few feet to 12 miles long.

PRICE, Complete, with Battery, Book of Instructions, Wire, and all necessary materials to put in operation, singly or on a short line	**$8 50**
Learners' Instrument, without Battery, &c.	**6 50**
Ornamental Learners' Instrument, Rubber Covered Coils, &c.	**7 50**

Same Instruments, wound with finer silk covered Wires, so as to operate satisfactorily lines up to twelve miles in length, $1.00 in addition to above prices.

A COPY OF SMITH'S MANUAL,

new and enlarged edition (see advertisement in another column) sent with each complete outfit of BUNNELL'S PERFECT LEARNERS' INSTRUMENT.

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Watson's Battery.

Patent May 30, 1876.

If you want to replace worn-out batteries, or to set up new ones, the WATSON BATTERY will be found to be the most convenient and satisfactory in every respect.

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Smith's Manual of Telegraphy,

TWELFTH EDITION.

Just Out! November, 1876.

Answers all questions about the expense and how to construct short lines of Telegraph. Price, 30c.

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Has every quality necessary to make it THE FAVORITE wherever it may be used—in telegraph offices, on private lines, in laboratories, or wherever constant, strong and reliable batteries are desired.

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MANUFACTURER OF

Kerite Insulated Telegraph Wire and Cables.

Manufactory, SEYMOUR, CONN.

Office, 120 BROADWAY, New York.

The Di-electrical properties of Kerite have been tested in every conceivable manner during the last few years and its superiority over all other kinds of insulation fully demonstrated.

Its durability has been proved by constant exposure to the sun and atmospheric changes of the thousands o miles of covered wire in use by the Fire Alarm and Telegraph Companies in many of the principal cities of the country. It has been largely used in the city of New York, under all conditions and exposures, for the last nine years, and at the present time its resistance is as great as when first exposed.

The facts are now fully established that Kerite is not injuriously affected by the extremes of heat and cold experienced in any climate, nor by length of exposure in the atmosphere.

It will endure long continued heat below 200° Fahrenheit-while for short intervals it may be subjected to 250 or 300°; and it may be safely immersed in boiling water.

The action of water, salt or fresh, not only protects all its qualities, but very much improves its insulation.

It is also unchanged by being placed in the ground.

Any corrosive elements in the earth do not act upon it; nor is it injured by the roots of plants, which soon destroy gutta-percha.

Acids act very slowly upon it, and then only to the extent of oxydizing the surface.

It will bear exposure to hot, strong solutions of alkalies without injury.

Mineral oils and illuminating gas, so far as known, do not produce any serious effect upon it.

Exposure in a city gas pipe has not injured it.

Thorough experiments have shown that it does not suffer injury by the most destructive insects of land or water.

Samples of the core or insulated conductor of Kerite cables have for a long period been laid in the Caribbean Sea, yet the "teredo," which would have speedily destroyed other cables thus exposed, has left these entirely unharmed. And experimental lines on the Isthmus have been equally exempt from the ravages of the white ant, which destroys wood telegraph poles so rapidly that iron poles have been substituted.

The same qualities which render it so indestructible by all corrosive agents, insure its durability for an indefinite period in all climates.

Neither gutta-percha nor vulcanized india rubber will bear storage in tropical climates without rapid deterioration, and undergoing chemical changes, which destroy their essential qualities, while under the same conditions the Kerite insulation is not changed in any respect.

The Kerite-covered wire is used almost exclusively by the United States Navy Department in the torpedo experiments which have been going on during the past three years. Prof. Farmer, the Government Instructor, says of it, "It fulfills the conditions required in the torpedo service better than any insulator with which I am acquainted."

John L. Lay, Esq., the inventor of the famous torpedo bearing his name, says that he thoroughly tested the Kerite cable in this country and also in Egypt, and finds it preferable to rubber or gutta-percha, heat not affecting it, and so far as his experience goes, it is proof against the "teredo."

Messrs. Gamewell & Co., proprietors of the American Fire Alarm and Police Telegraph have used the Kerite wire for ten years. They say: "We have placed it in use in some sixty cities, extending from Halifax, Nova Scotia, on the north to New Orleans and San Francisco on the south and west, embracing every variety of climate, and it has proved itself to be, under all circumstances, the most reliable and indestructible Insulator known to us for telegraphic purposes."

The experience of other parties using the Kerite-coated wire overhead, underground and under water is almost precisely similar and is well summarized in the following opinion of George B. Prescott, Esq., the Electrician of the Western Union Telegraph Company. Mr. Prescott says: "In September, 1869, we placed some of your Kerite wire, unprotected by any covering whatever, in the tunnel under the river in Chicago, and have since continued its use in that exposed situation with the most gratifying results. A portion of the tunnel is very wet, and water saturated with lime constantly drips upon the wires, while in other portions they are kept alternately wet and dry, which is well known to be one of the severest tests that any insulating material of an organic nature can be subjected to; and yet, after five years' exposure, under the above conditions, the Kerite covering shows no signs of decay or deterioration. An insulating covering of india rubber or gutta-percha under a like exposure, would have been destroyed in much less time."

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This Holder is intended to save the last half or third of the pencil.

DIRECTIONS:

When pencil becomes too short to write with comfortably, shave down the butt and screw into the holder. The screw makes its own thread. Will hold the pencil perfectly firm.

PRICE 25 CENTS EACH. Sent by mail on receipt of price.

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This is the ONLY one which which is perfectly suitable for all open circuit work such as Electric Bell ringing, hotel and house annunciators, burglar alarms, signals, laboratory experiments, etc., or wherever a battery is wanted which is clean, free from acids, always ready for use, and does not consume when not in operation.

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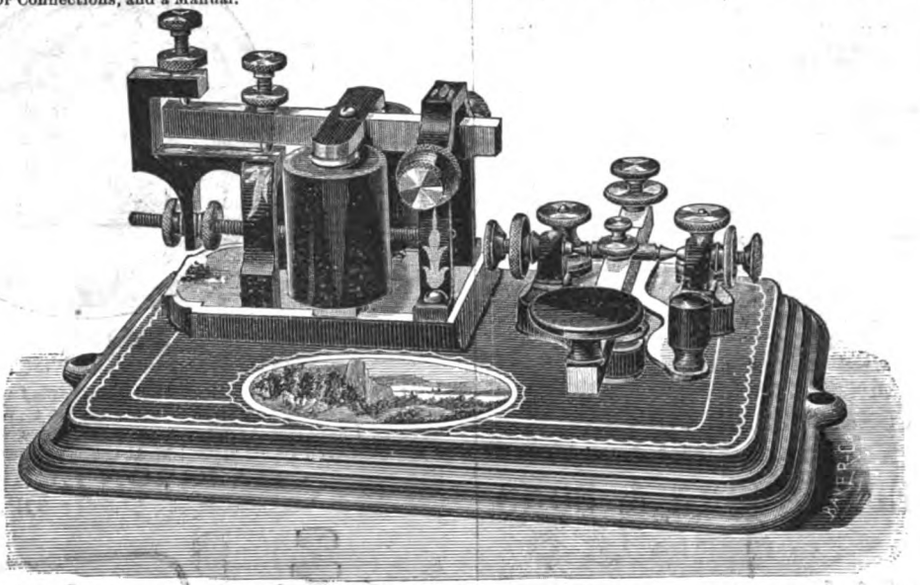

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In ordering give the length of the line, so that the resistance of the magnets may be rightly proportioned.

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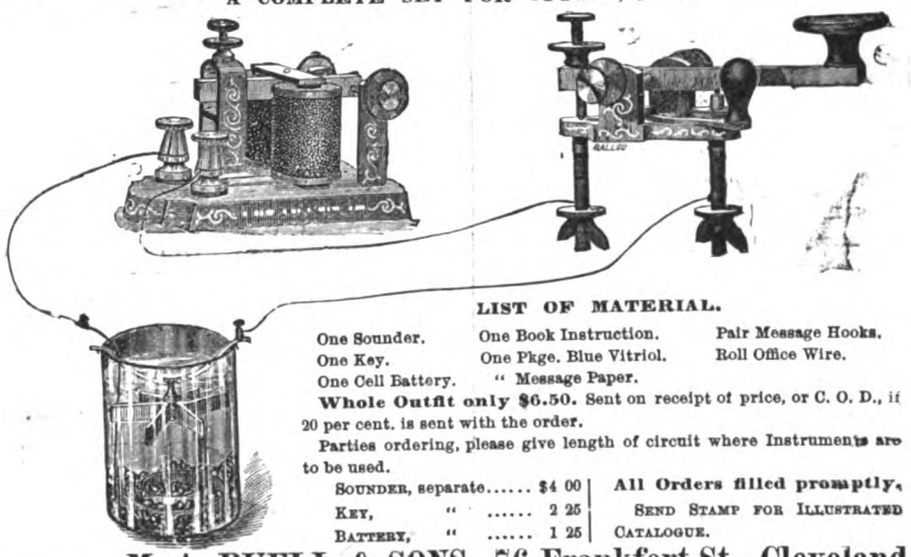

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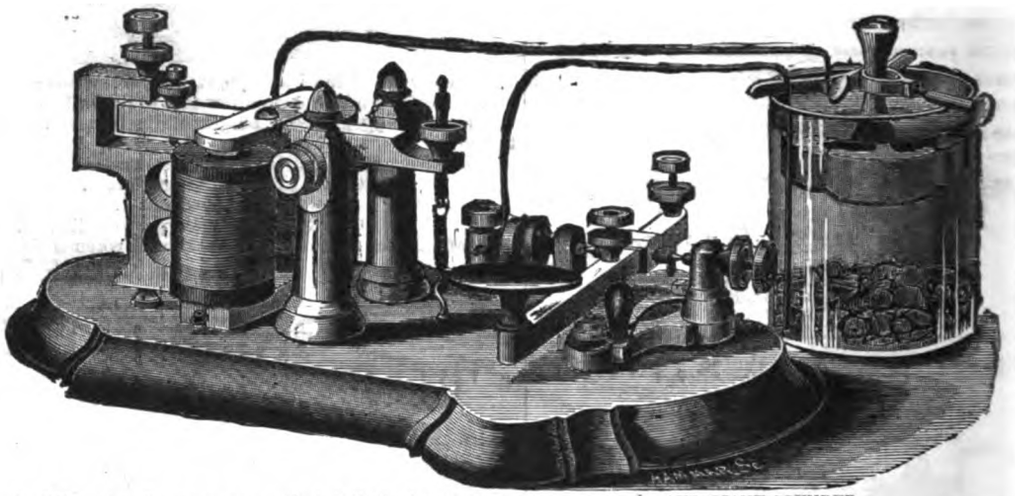

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The only patent awarded any Sounder. THE ONLY SOUNDER RECEIVING ANY PREMIUM AT THE CENTENNIAL EXPOSITION. Works with less Battery than any other Sounder known. Has the clearest and loudest tone. Is the most beautiful in design and finish. The most extensively used, and warranted the best in existence. Boxed free of charge, and shipped to any part of the world, upon receipt of money order or draft for $6.

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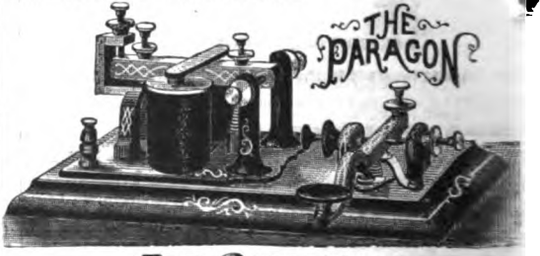

THE PARAGON,

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SPECIALTY SOUNDER, $4.00
SPECIALTY KEY, 2.00 } PARAGON, $5.00

Extra Resistance for line from one to ten miles, $1.00.

20 per cent. discount from above for remittance with order.

1 Cell No. 1 Callaud, Manual, Office wire and Chemicals, for Learners Outfit, - - - - - - $1 75.

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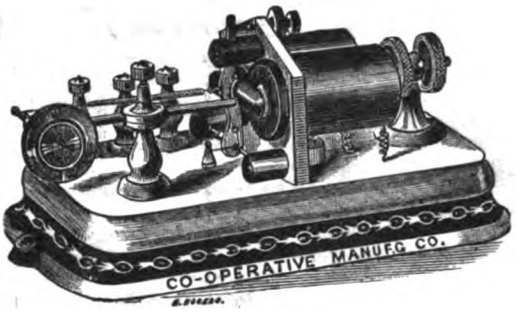

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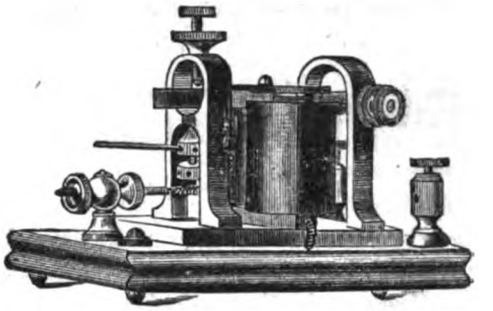

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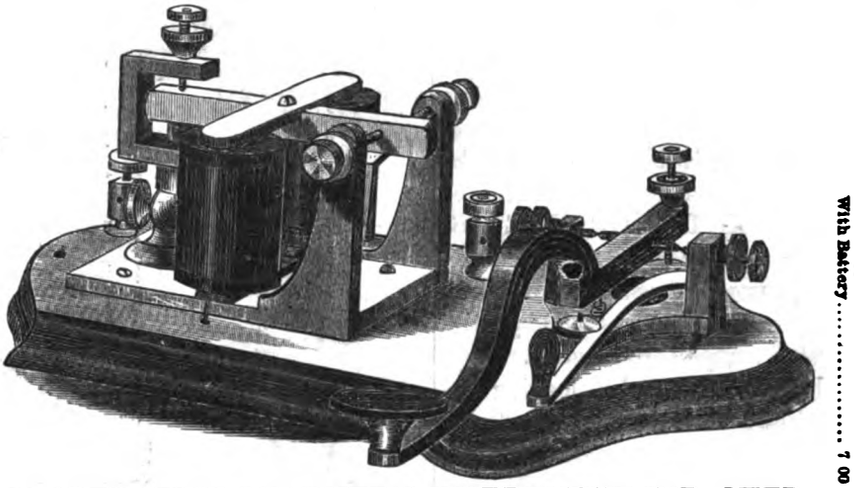

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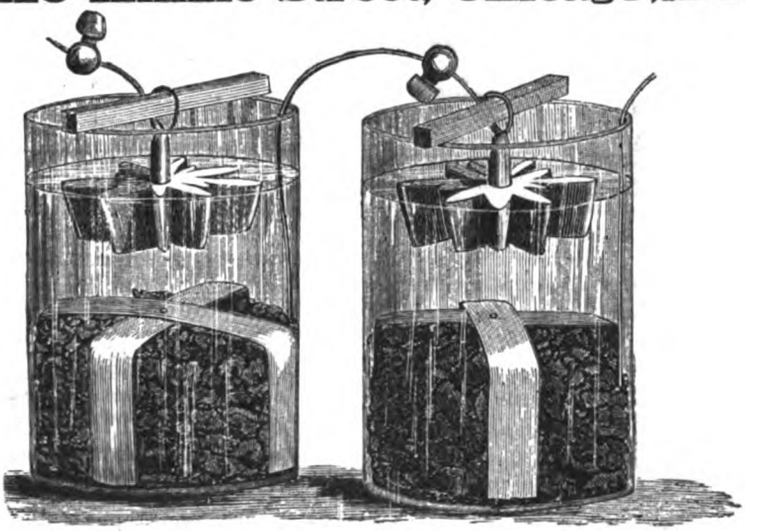

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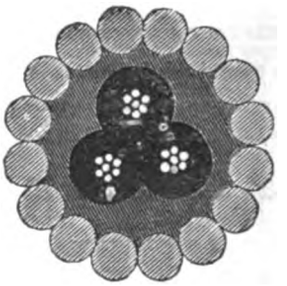

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JOURNAL OF THE TELEGRAPH.

VOL. X., NO. 3. NEW YORK, FEBRUARY 1, 1877. WHOLE NO. 222.

INFLUENCE OF ATMOSPHERIC ELECTRICITY AND INDUCED EARTH CURRENTS IN TELEGRAPHY.

As long ago as 1752, Franklin demonstrated conclusively, by the well-known kite experiment, that when a thunder storm is in progress, the upper portion of the atmosphere is in an electrified condition. He has also shown that the storm breaks forth as soon as a discharge of the electricity contained in the clouds takes place, either directly with the earth or with other clouds charged oppositely. Various experiments since Franklin's time have shown that traces of electricity are to be found in the atmosphere at almost all times. One of the simplest ways of showing this is to erect a conducting rod in the air and connect its lower end to an electroscope, Peltiers' electrometer, fig. 1, answers the purpose very well.

When the sky is clear, the air is always positively electrified to a height of perhaps five feet above the earth's surface, but the electric potential at that distance is not very perceptible except with the most delicate apparatus, it increases however, with the elevation, but is not the same for any one point at different times of the day, there being maximum and minimum conditions. The former occur about two hours after, and the latter about the same length of time before sunrise and sunset.

When the atmosphere is positively electrified it acts inductively on the earth so that the latter is almost always found to be negative with respect to the former, but owing to the very great insulating properties of air the two electricities do not unite as a general thing except during thunderstorms, at such times the electric accumulation becomes so great that it is enabled to break through the insulation of the atmosphere and a discharge takes place almost instantaneously.

As regards the real cause of atmospheric electricity physicists still differ but it is generally conceded that the rapidity of evaporation, especially at sea, and the subsequent condensation of aqueous vapor in the upper air currents which flow from the poles, has something to do with the phenomenon.

Clouds are charged sometimes with positive and sometimes with negative electricity. The positive charge is supposed to be derived directly from the atmosphere by the vapory particles floating therein, and which, before condensation occupy comparatively vast fields of space. In the process of condensation or cloud formation, the electricity distributed over these extended tracts becomes concentrated within narrow limits and the clouds thus acquire large quantities of electricity of high potential. The negative charge, it is assumed, is derived from contact of the cloud with the earth. In what follows we will suppose the charge to be positive. When a cloud W fig. 2 so charged passes over a place it disturbs the electric equilibrium of all bodies beneath it, attracting the negative electricity to the parts A and B in its immediate vicinity and repelling the positive to the more remote parts D and C. As the elevation of the objects above the earth's surface and their conductivity increase the accumulation or charge which they receive becomes greater. It is therefore obvious that a metallic conductor such as a telegraph line whose termini are in communication with the earth will attain its maximum charge sooner than other and less elevated objects. Men and beast do not, as a general thing, perceive any change of the neutral state from this inductive action because it is produced in a gradual manner by the nearer approach of the cloud. When the latter disappears without the establishment of equilibrium between W and A B by direct discharge, the negative electricity at A

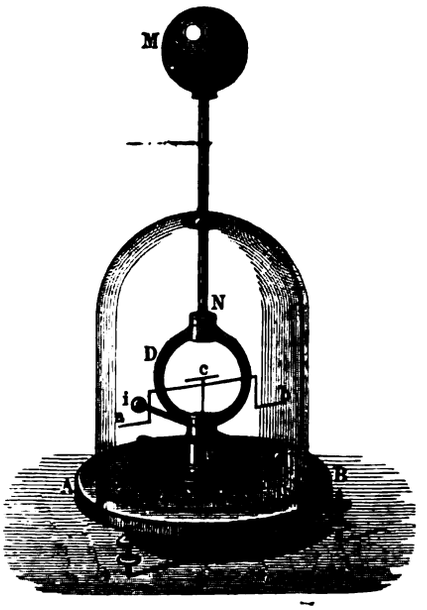

Figure 1.

B gradually reunites with the positive at D and C. and a telegraph line LL_1 between these points is traversed by a current.

If the electricity of the cloud W is suddenly removed as for instance by a discharge into a neighboring cloud these currents become strong enough to make themselves manifest by their action on the apparatus and it sometimes happens that they are so frequent as to greatly interfere with, or even altogether prevent the working of the line.

From numerous careful experiments it appears that telegraph lines are almost always traversed by currents due to actions of this kind, even in clear weather, but at such times they are too feeble to be observed unless special means are taken for that purpose. They are more marked, after some days of hot weather, a sudden change of temperature, or at the beginning of a rain or hail storm.

The disappearance of a heavily charged cloud from any given place is not, in general, so rapid as its appearance because of the attractive influence exerted between the positive electricity of its own charge and the induced negative charge on the earth's surface below it; this influence moreover, tends to draw the cloud nearer and nearer to the earth and at the same time causes the opposite charges to concentrate within more narrow limits until finally the potential becomes great enough to break through the intervening air stratum, as before remarked, and a flash of lightning occurs.

In such cases the greater part of the electricity of the cloud is discharged and the electric equilibrium of the earth below renewed, as shown by the momentary current in the line $L L^1$, fig. 2, even though the latter is not in the direct line of the discharge. Any remaining portion of charge in W, if sufficiently large, again acts inductively on the earth, and thus forms the necessary conditions for another flash, sometimes, indeed, for many more of them, until the cloud becomes completely discharged and the storm is passed. It is evident, from the above, that an electric disturbance always precedes the appearance of lightning. This is especially marked in elevated objects, which, as such, soonest reach a limiting charge, and also, by reason of their comparatively low resistance, offer a ready path for the combination of the opposite electricities of the earth and clouds. Telegraph lines fulfil the last condition very perfectly, and being also very extensively developed, thus become particularly liable to being struck by lightning.

The disturbing influence of lightning on a telegraph line is well known. If the wire itself or any object in its vicinity is struck interruptions or damage to the wires and instruments of a more or less serious nature will follow unless special precautions have been taken to guard against such results. It is also a fact that slight interruptions are apparent at a distance of even three or four hundred miles from the place where the storm is in progress. We thus see that it is possible by merely observing whether the disturbance gradually increases or decreases, to determine when a storm is approaching us or passing in the opposite direction. When, however, the storm is near and heavy, large quantities of electricity of high tension instead of following the route of the wires alone, frequently enter the station and pass in the form of sparks from the line and neighboring metallic parts to earth by way of the ground wires or such other means as may be available. Sparks have been seen to pass in this manner from one object to another although the latter were some yards apart. In all such cases fusion of the wires and other damage is sure to follow.

From the preceding remarks is is evident that all of the general phenomena of interruptions from atmospheric electricity may be classed under the four following heads :—

1st Interruptions produced when the line is in the

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occupied in doing so. In like manner the quantity of current traversing a circuit is directly proportional to the electromotive force, and inversely proportional to the resistance. The speed of a train may be increased either by increasing the space passed over in a given time, or diminishing the time occupied in traversing a given space. In like manner the current in a circuit may be increased by increasing the electromotive force without changing the resistance, or by diminishing the resistance without changing the electromotive force.

Alexander Bain and his Inventions.

We are called upon to announce the death of another one of the few remaining pioneers and inventors, whose names during all coming time will be indissolubly linked with the early history of the electric telegraph. Alexander Bain, who is best known to the present generation of telegraphers in connection with the electro-chemical and the automatic systems of telegraphy, died in the early part of January, aged 66 years, at the Home for Incurables, near Glasgow, Scotland, of which institution, in consequence of an attack of paralysis, he had been for some years an inmate. Mr. Bain may justly be considered one of the fathers of the electric telegraph. His connection with it dates back nearly to the year 1837, at which time he came to London from his early home at Thurso, in the north of Scotland, with the intention of following his trade as a journeyman clock and watch-maker. Very shortly after his arrival in that city, while attending a lecture on electricity at the Adelaide gallery, his ingenious and fertile mind conceived the idea of employing electricity as a motive power for clocks, which in turn suggested the invention of a printing telegraph. By the summer of 1840, he had completed models of both these inventions, which he exhibited to Mr. Baddeley, assistant editor of the *Mechanic's Magazine*. This gentleman advised Bain to show his inventions to Professor Wheatstone at Kings College, which he accordingly did. The latter gentleman having, as it afterwards appeared, already conceived and partially worked out two inventions intended for the same purpose, entered into an arrangement with Bain to unite his interest with his own, which resulted in an unfortunate controversy in regard to the originality of the inventions themselves. A patent for the electric clock was, however, granted to Bain early in 1841, in which can be traced the origin of nearly every variety of this kind of mechanism now in use. From this time Bain became a very prolific inventor, and patented in rapid succession a large number of useful improvements in electro-mechanism. His patent for a printing telegraph (1841) contained the device of a wire coil freely suspended in the vicinity of a powerful permanent magnet, which has been so beautifully adapted by Sir William Thomson to his syphon recorder for submarine cables. Another patent in 1843, embraces the earth battery, the principle of the method of copying surfaces upon chemical paper regulated by the synchronous movement of two pendulums, which at a later date was developed by others into the autographic telegraph, and an effective though incomplete fire and police telegraph apparatus, which the genius of Channing and Farmer subsequently elaborated into the highly organized and perfected American system of to-day.

In 1845 Bain produced the electric thermostat for giving warning of fire in the holds of vessels, the expansion of mercury in a tube being employed to close the circuit and move an indicator above; also an electric sounding apparatus, now known as the electric log. In December, 1846, he patented his well known electro-chemical automatic telegraph, employing for the first time the method of transmission by means of perforated paper. This strikingly novel invention seemed destined to produce a sensation in telegraphic circles on both sides of the Atlantic. While on exhibition before the officers of the Electric Telegraph Company, which had thus far succeeded in maintaining a practical monopoly of the telegraph in Great Britain, one of the regulating springs chanced to break, allowing the clockwork to travel with uncontrolled speed. To the great surprise of all present, the whole message was found to have been correctly transmitted and recorded at the rate of several hundred words per minute, whereupon the Electric company purchased the invention without delay, paying some $30,000 therefor. They employed the method of recording on chemical paper to some extent for a number of years, until it was superseded by the Morse ink-writer, which made its way into England from the continent.

In 1848, Bain came to the United States in order to obtain a patent on his invention here, but his application was rejected on the ground that it was substantially anticipated by that of Morse. Supposing this decision final, he left Washington to return to England, but was met in New York by Mr. Henry O'Reilly, who induced him to appeal to the Supreme Court. He did so, and the decision of the Commissioner was overruled and a patent issued to him. Immediately upon the granting of the patent, an opposition line was commenced between New York and Boston, the funds being furnished by prominent merchants of the two cities, to be worked upon the new system. The monopoly which had existed since the establishment of the telegraph had become so unpopular that the construction of this line was regarded as a public blessing. It was completed in 1849, and other lines were at once extended from New York to Buffalo and Washington, from Boston to Montreal and Portland, and from Louisville to Cincinnati and New Orleans. In 1852, after a prolonged and expensive litigation, the Bain lines were absorbed by their competitors, and the system was abandoned, except between Boston and Montreal, where it was still in use as late as 1860. From 1849 until a short time before his death, the late General Marshal Lefferts devoted much time and money to the development of Bain's fast system, but with little practical success. Although it has been considerably improved by the labors of Little, Edison, Grace and others, and within a few years vast sums of money have been expended in its development, yet, the rapid progress of other and more practical systems renders its prospects of future usefulness, at least in this country, more and more problematical.

Among Mr. Bain's minor inventions may be mentioned that of playing upon musical instruments at a distance by means of electro-magnets whose action is controlled by a perforated music sheet, which he originated as early as 1847.

We hear but little of Mr. Bain as an inventor after he returned from this country to England. In 1863 he revisited America, but it was evident at that time that he had fallen into unfortunate habits, which were rapidly undermining his mental and bodily powers. For several years before his death he received a well-deserved pension from the British Government, and it is a consolation to his friends in America to know that his declining years were at least passed in comparative comfort. P.

A Puzzled Magistrate.

BY TOM QUAD.

His Honor moved slightly in his chair and leaned his elbow upon the desk before him, as he said:

"You are a telegraph operator, are you?"

"Yes, sir."

"And this is your first trouble?"

"Wal, no. I've seen a sight of trouble before."

"What kind?"

"Mostly swinging trouble, sir."

"Swinging trouble! exclaimed the Judge; "you don't mean you've been swung up!"

"Wal, no, I was on a line, you see."

"On a line. Swung on a line! you are talking in riddles, young man."

"Hum! The gang just got to hoopin' her up——"

"Oh, there was a woman in it, was there; well, sir."

"No; you see, they was a-hooping her up——"

"Hooping who up?"

"Why, the whole racket, you know; and we was just let'n 'em come and a givin' each other stiffs, you know, Jim——"

"No familiarity, young man. Explain yourself. I do not understand you."

"Hoo! O. K. I tum. You don't get me, Eh! What's the 18? Too light?"

"What's that," said his Honor, thinking the operator was making game of him, "What's that?"

"No stiff. I got salted, roasted, too——"

"Salted and roasted! This officer said you were arrested for fighting."

"Um. Fighting? Why, I was just putting on the Automatic like, and the plug broke so much——"

"Plug! Broke! Automatic! See here, young man, what do you take me for? I want to know about this row now at once."

"I drop! He was fresh, and was going to snatch me, and I kicked.

"Yes; go on."

"And I kicked, and the whole thing kinder busted you know, as tho' a big battery was grounded right in the switch."

"Now, young man, look here, you'll get switched out of this mighty quick."

"Stop 'er, Jim. I got taken off ter once, and the next thing I got was a break from his nibs, there, (jerking his thumb towards the Policeman) and I weakened."

"Give him sixty days!" roared His Honor, excitedly, and the operator went out, muttering something about an infernal roast.

Bell's Telephone or Vocal Telegraph.

The following account of experiments with the Telephone or Vocal Telegraph, of which Mr. A. G Bell, claims to be the inventor, is condensed from the *Boston Transcript* of the 1st ult.

"The telephone, in its present form, consists of a powerful compound, permanent magnet, to the poles of which are attached ordinary telegraph coils of insulated wire. In front of the poles, surrounded by these coils of wire, is placed a diaphragm of iron. A mouthpiece to converge the sound upon this diaphragm substantially completes the arrangement As is well known, the motion of steel or iron in front of the poles of a magnet creates a current of electricity in coils so surrounding the poles of the magnet, and the duration of this current of electricity coincides with the duration of the motion of the steel or iron moved or vibrated in the proximity of the magnet. When the human voice causes the diaphragm to vibrate, electrical undulations are induced in the coils environing the magnets, precisely analogous to the undulations of the air produced by that voice. These coils are connected with the line wire, which may be of any length, provided the insulation be good. The undulations, which are induced in these coils travel through the line wire.

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and, passing through the coils of an instrument of precisely similar construction at the distant station, are again resolved into air undulations by the diaphragm of this instrument.

The simplicity of Prof. Bell's system will be apparant when it is known that the voltaic battery is entirely dispensed with. All that is required for communicating between the most distant points are the instruments and the telegraph wire, the latter taking the place of the speaking tube and the former that of the mouthpieces.

The experiments yesterday were as follows: Telephones having been connected with the private telegraphic line of the Boston Rubber Shoe Company, and the operators at either end having taken up their stations, conversation was at once commenced. Stationed at the Boston end of the wire, Prof. Bell requested Mr. Watson to speak in loud tones, with a view of enabling the entire company at once to distinguish the sounds.

This was so successful that a smile of mingled pleasure and surprise played on the features of those present. That it, however, might not be supposed that loud speaking was essential to intelligibility, Mr. Bell explained that soft tones could be heard across the wires even more distinctly than loud utterances, even a whisper being audible. In confirmation of this statement, Mr. Watson commenced speaking in turn with each member of the company, and after the efficiency of this method had been proved to the satisfaction of all, he took up a newspaper and informed the assemblage that gold had closed the previous evening at New York at 105⅜. As there were quite a number of business men present the effect that this practicable demonstration of the value of the telephone produced can scarcely be exaggerated. Other passages from the daily journals were then given, and by this time the desire for conversation having become general, Mr. Watson was plied with questions such as "Is it thawing or freezing at Malden?" "Who will be the next president?" etc. It was remarkable that Mr. Watson was able to distinguish between the voices at the Boston end, he calling at least one gentleman by name as soon as the latter commenced speaking.

This went on for some time, until a lady at the Malden end sent the company an invitation to lunch per telephone, and an appropiate response was made by the same medium. At length the company were requested to remain quiet while a lady at the other end conveyed to them the sweet strains of music. The assemblage thereupon listened with rapt attention while a young lady commenced singing "The Last Rose of Summer." The effect was simply charming. Possessing, as the fair cantatrice does, a voice of exquisite sweetness, the sounds penetrated into the Boston end of the telephone with a distinctness equal to that attainable in the more distant parts of a large concert room, and a unanimous vote of thanks was sent by the handy little instrument which had procured for the assemblage so agreeable an hour.'

TELEGRAPHIC LITIGATION.

An Action to Decide Finally the Title to Duplex Telegraph Inventions.

The Western Union Telegraph Company has commenced in the Superior Court in this City, a suit against the Atlantic and Pacific Telegraph Company, the American Automatic Telegraph Company, Geo. Harrington, Jay Gould, T. A. Edison and others for the purpose of establishing its title to the duplex and quadruplex inventions and patents of the defendant Edison.

The complaint recites at length the agreements entered into between Edison and Geo. B. Prescott, the electrician of the company for developing the duplex and quaduplex inventions of the former, also the agreements between Edison and Prescott and the company for the purchase of said inventions, and the patents to be issued therefor.

It is further claimed that Jay Gould and officers of the Atlantic and Pacific Telegraph Company induced the defendant Edison to discontinue his relations with Prescott and with the plaintiff, and to transfer the patents for said inventions to them, and that this was a scheme to defraud the Western Union Company, as Edison had already assigned the same to the plaintiff.

Edison had filed claims numbered from 94 to 100, the important one being No. 99. Patents on these claims have been allowed to Edison and Prescott, but have not been issued because of a suit in the Superior Court by the Atlantic and Pacific Telegraph Company, in which an injunction was issued last April. George Harrington, however, claims that Edison agreed with him either individually or as trustee for the American Automatic Telegraph Company, to assign for the benefit of that company all his patents in telegraphy to be made thereafter. The Commissioner of Patents overruled that claim, but it comes up in another shape. Harrington's right rests on two instruments, one dated April 4, 1871, the other Oct. 1, 1870, the latter not being recorded in the Patent Office until Jan. 11, 1875. Harrington has assigned his rights, and all his assignees are made parties to the suit. The plaintiff denies Harrington's right to anything, and consequently his right to assign anything, and sets up a suit by Harrington and Edison in the United States courts to enjoin the Atlantic and Pacific Telegraph Company from using the quadruplex machine.

The plaintiff further alleges that before the filing of Claim No. 99, Edison had filed a Claim H; that Claim No. 99 in law superseded Claim H, but that Edison, in fraud of the plaintiff's rights, got issued to himself and Harrington a patent—No. 162,633—under Claim H, and the Atlantic and Pacific Telegraph Company has obtained, without the consent of Harrington and Edison, the letters-patent. There is a suit in New Jersey by the plaintiff against Edison and Prescott; a suit by Edison and Harrington in the District of Columbia against this plaintiff and others; a suit by Harrington and Edison against the plaintiff and Prescott in the United States Circuit Court in New-York, besides the other suits mentioned. There are three other claims for patents which the plaintiff says Edison should, under his agreement, press for its behalf. The plaintiff asks a decree that Edison and Prescott prosecute for its benefit all the claims for patents already filed, and assign to it the patents issued, a decree that patent 162,633 be surrendered and assigned to the plaintiff, and that all the pending suits be enjoined until the determination of the rights of the parties in this suit.

Upon the application of the plaintiff, February 21st, Judge Sedgewick granted a temporary injunction in accordance with the application, and a further hearing will be had on the 6th inst.

A Telegraph Operator Convicted of Embezzlement Sentenced to Two Years Imprisonment.

In the Court of Quarter Sessions, held in Jersey City, N. J., on Friday, Feby. 23d by Judge Hoffman, an operator named William McNutt, recently in the employ of the Western Union Telegraph Company, was tried and convicted for embezzling from that company.

McNutt, who was previously employed in the service of another company in Jersey City, was strongly recommended to the officers of the Western Union Company, and was finally engaged as an operator in the Jersey City office, of which Mr. G. Ross Cary is manager. After McNutt had been in the office for a time, Mr. Cary was led to suspect that he was not altogether trustworthy. He was finally detected in receiving money for messages handed in for transmission when he was left temporarily in charge, and after transmitting them, destroying the originals, without making the usual entry, and retaining the money received for the service.

Mrs. Jones, with whom McNutt boarded, found in his room during his absence a number of originals of messages, and communicated the fact to her husband, who is also in the employ of the company. He took them to Mr. Cary, and it being evident that the money received for these despatches had been embezzled, and the dispatches taken from the office to prevent detection, Mr. Cary caused him to be arrested.

Upon the trial Mr. Cary testified that the prisoner admitted to him that he had taken certain sums of money received for the company, giving the amount for each of three months. Mr. and Mrs. Jones testified to finding the dispatches in McNutt's room.

The prisoner testified in his own behalf and denied all the statements of the witnesses against him, and emphatically denied ever having made any confession to Mr. Cary.

Mr. Cary is well known and highly esteemed in Jersey City, having had charge of the telegraph office there for nearly twenty-five years, and adding perjury to his previous crime, only made it worse for the culprit. The court promptly found the defendant guilty, Judge Hoffman saying that he was guilty not only of the crime alleged against him, but also of the most glaring perjury, and that, had he pleaded guilty, his punishment would have been lighter. He then sentenced him to the State prison for two years. He has a wife and one child, who are compelled to suffer for the rascality of their husband and father.

[From the New York *Times*, February 20, 1877.]

Prescott's Electricity and Electric Telegraph.

George B. Prescott's book on electricity and the electric telegraph, just published by Appleton, is not only a compilation in which the best English and German authorities have been consulted, but has the sovereign merit of being written by a person bred to the profession. If we are correctly informed, Mr. Prescott still holds the position of chief electrician over the vast system of lines employed by the Western Union. This ought to be in itself recommendation enough. The book is fully illustrated with woodcuts of decided excellence, giving the latest and most important machines, instruments necessary to explanations, and diagrams to facilitate an understanding of the text. Mr. Prescott begins in an elementary chapter with "frictional electricity," and plunges later on into such a thorough examination of the latest improvements in the methods of telegraphy as only a working operator could. The appendix contains tables for the use of students. The volume might form an excellent text-book in schools of telegraphy, or for special students at colleges. It is eminently fitting that an American should be the author of a work on a mechanical art which owes so much to the citizens of the United States.

The traffic receipts of the Brazilian Submarine Telegraph Company for the month of January amounted to £11,469, as against £12,146 (the corrected amount) for the corresponding period of 1876. The Western and Brazilian Company's Bahia-Rio de Janeiro section was interrupted twenty-two days.

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Journal of the Telegraph.

Published Semi-monthly at 195 Broadway.

J. N. ASHLEY, EDITOR.

The Journal is issued on the 1st and 15th of each month. Its circulation is about 10,000. It goes to every State, Territory and Province on the Continent. No better medium for advertising exists.

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A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, FEBRUARY 15, 1877.

TRANSFER SERVICE.

In addition to the changes in this service already made by orders in recent numbers of the Journal of the Telegraph others are under consideration and will soon follow.

It is expected that an order will be published in the next issue of the Journal to take effect on 1st April next, establishing a uniform charge for telegraph tolls on each transfer of a sum equal to double tolls on a single fifteen word message between the transfer places.

This will be a considerable reduction from present average tolls, and will facilitate computation and enable customers to learn the amount of charge before writing the message.

CENTENNIAL AWARD TO THE QUADRUPLEX TELEGRAPH SYSTEM EXHIBITED BY THE WESTERN UNION TELEGRAPH COMPANY.

The Western Union Telegraph Company exhibited at the Centennial Exhibition at Philadelphia a set of improved quadruplex apparatus similar to those used upon its lines. These attracted much attention, and received a very complimentary report from Sir Wm. Thomson, the Judge who examined them. Upon this report a Diploma and Medal were awarded to the Company.

Important improvements have been effected in the quadruplex system and apparatus since its exhibition at Philadelphia, which greatly increase its usefulness and the reliability and facility with which it can be worked on long lines.

THE WELFARE OF TELEGRAPH EMPLOYES AND THE WESTERN UNION COMPANY IDENTICAL.

The reduction of telegraph charges below a remunerative basis, however it may affect telegraph property, or be regarded by the public, is certainly not likely to prove advantageous to telegraph employés. It has been argued, and the argument has certainly a plausible basis, that competition in telegraphy is beneficial to telegraph employés in that it increases the demand for their services, and gives them a choice of employers. There is however another side even to this view of the matter. If competition results in impoverishing telegraph employers, it must react upon telegraph employés. Under such circumstances as large salaries cannot be paid to the employés as otherwise, and even if promised, payment must be defaulted to a greater or less extent. No business can or will be carried on at a loss without eventually a portion of that loss being assessed upon those engaged in its practical duties.

There is a certain amount of telegraphing to be done, and this is not materially increased or decreased by division among two or more competitors. It is in reality merely a question as to the greater or less cost of doing the business, and the relative amount received therefor. It certainly costs more to maintain two or more organizations for the purpose than it would if the business were concentrated in a single enterprise, and the amount of the receipts which can be invested in compensation to those practically engaged in its transaction must be apportioned accordingly.

It is true that a reduction of charges to an unremunerative basis may increase the amount of business offered, but we fail to see where this can in reality benefit the employés. It seems to us therefore that the real interests of telegraph employés must be opposed to any reckless competition, and that those who favor such a course do not appreciate its effect upon them personally.

What employés should desire, for their own sakes if for no other or higher motive, is that telegraph companies should be prosperous, and that anything more than fair and reasonable competition at the utmost should be discountenanced.

There are many thousands of persons engaged in the telegraph service in this country, and the number is constantly increasing. The developement of the business is constant, and is likely to continue indefinitely. The true policy then for employers and employés alike, and for the public as well, is that which shall prove remunerative, and which shall enable telegraph companies to adopt and pay for all real improvements in lines and equipments which will add to the facilities and diminish their relative cost, and insure, so far as the public is concerned, the business being done promptly, accurately and satisfactorily. This requires the employment of the best available talent, and under such a condition of the service, this will be assured of adequate compensation. It is a trite saying that "corporations have no souls," but admitting this they are necessarily governed by self-interest, and in the telegraph business this interest does not lie in the employment of inferior and ill-paid labor. Very few of us receive all that we consider ourselves entitled to or would like to obtain for our services, but in telegraphy, at least in the future, brains will be at a premium, and those who are best qualified by natural ability, study and application, will receive the preference and the highest compensation. This result, so desirable to all now engaged or who hereafter may engage in telegraphic service, may be retarded and delayed by unreasonable and speculative competition, and for this reason we hold that such competition is antagonistic to the best interests of telegraph employés, and should not be applauded or encouraged by them. Reductions in charges for telegraph service from time to time are inevitable, and this fact has been recognized by the present executive managers of the Western Union Telegraph Company for years, and a systematic and well considered policy of simplification and reduction of charges steadily and consistently followed. In carrying out this policy its effect upon the interests of the employés has been carefully considered, and it has been done without antagonising their welfare. These facts should be considered by telegraph employés, whose best interests in this country are indissolubly connected with the continued prosperity of that company.

A SMALL BUT CERTAIN DIVIDEND.

The new directors of the Atlantic and Pacific Telegraph Company have not escaped the attention of the ubiquitous interviewers of the daily press. One of these was recently taken in hand by a reporter of the *New York Herald*, and unburdened his mind in relation to telegraph matters, and especially with regard to the policy of his company, in a manner which suggests the idea that the interview was not entirely unwelcome.

Of course in the opinion of the gentlemen interviewed, the Western Union Telegraph Company is a "selfish monopoly" (?) and the Atlantic and Pacific a public benefactor, actuated mainly by the desire to serve the public and relieve it from the terrible "exactions" and "injustice" of the former company. He, however, concedes that his company is not actuated by "philanthropic motives purely." The reductions of charges for telegraph service, made and to be made, have, it appears, been "carefully estimated," and when its new lines are constructed a "small but certain dividend" is in his opinion, as expressed through the interviewer, insured to the stockholders. If he lives until that dividend is earned he will be likely to rival Methuselah as the "oldest inhabitant"; and there is no danger of his filling an untimely grave. With a capital representing over $1,000 per mile of wire; (the Western Union capital is but $184 to the mile of wire), and which is still issued in any desired amount at one fifth of its nominal valne, the dividends under the most advantageous circumstances would unquestionably be *small* enough! as to their *certainty*, the personal guaranty of some financially responsible party would doubtless be regarded as much more satisfactory to innocent holders of its stock.

Naturally the views of the gentleman interviewed of the condition and prospects of the Western Union Company are depressed and depressing. It is true it has earned and is earning that to which the Atlantic and Pacific Stockholders have been and are likely to be strangers, a reasonable dividend for its shareholders, but then it is "exacting" and "selfish"; and for these iniquities better and more reasonable ser-

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vice, and a systematic and steady reduction of charges for such service are no atonement, and it must suffer the consequences.

It is truly refreshing to learn from this guileless gentleman that the Atlantic and Pacific has taken the "initiative in reducing the rates of telegraphic charges," Facts and figures, it is true, do not verify the assertion, but these are of small account where the speculative interests of that company and its managers are concerned.

If this gentleman is to be regarded as a "truly good man," we fear that like some others he is afflicted with "wicked partners," who are leading him far from the paths of probity and financial rectitude, and that continued business association with them may so demoralize him, that even the interviewers will regard his statements with suspicion and the public discredit them altogether.

CENTENNIAL AWARD TO THE GOLD AND STOCK TELEGRAPH COMPANY.

Phelps' Gold and Stock Printer.

The Gold and Stock Telegraph Company have received from the United States Centennial Commission a very flattering award of a diploma and medal for the Gold and Stock Printing Telegraph Instrument, invented by Mr. G. M. Phelps, Superintendent of the manufactory of the Western Union Telegraph Company in this city, and exhibited by the Gold and Stock Telegraph Company.

The judges who examined the instrument recommend it for the following reasons:

This very remarkable instrument, invented by George M. Phelps, is adapted to transmit and to record automatically the prices of gold and stocks from a central office to any number of branch offices or private places of business simultaneously. The complicated practical problem is skillfully treated and solved in a thoroughly useful manner in Mr. Phelps' instrument.

The Gold and Stock Telegraph Company is always prompt to adopt real and useful improvements adapted to give satisfaction in the conduct of its business, and by so doing renders successful competition in its specialties impracticable.

NEW PUBLICATIONS.

Electricity and the Electric Telegraph, by George B. Prescott. With Illustrations. New York, D. Appleton & Co., 1877.

Few persons, we imagine, have any adequate idea of the extent of the existing literature upon the subject of Electricity, especially in connection with the most important of its practical applications, the Electric Telegraph.

Among the earliest authors deserving of honorable mention in this connection. as having produced works of real and permanent value, the names of Joseph Priestly and Benjamin Franklin stand pre-eminent. The former was one of the foremost chemists and natural philosophers of his day, and in 1767 published in London a large quarto volume entitled the *History and Present State of Electricity, with Original Experiments*, which procured him the degree of L. L. D. from the University of Edinburgh, and an election as Fellow of the Royal Society. Among the original experiments given in this work, was one which established for the first time the comparative resistance of several of the principal metals; an experiment which opened the way which led step by step to our present exact knowledge of the science. Driven from his native country by religious persecution, Priestly, in 1794, found an asylum in the quiet and beautiful village of Northumberland, Penn., where he died in 1804. Franklin, who was a contemporary and correspondent of Priestly, published a work in 1774. The earliest printed publication on the Electric Telegraph is a description of Wheatstone's five needle telegraph, which was published in 1839, by T. S. Hodson, of Hatton Garden, London.

American telegraphic literature dates back to 1845, when Alfred Vail, the associate and assistant of Professor Morse, a man whose labors in perfecting the successful telegraph of to-day have strangely failed to receive the recognition which is their due, published his modest book of two hundred and eight pages, entitled the *American Electro-Magnetic Telegraph, with the Reports of Congress, and a description of all the Telegraphs known.*

Thirty years have passed since the publication of Mr. Vail's work. The single solitary lines between Slough and Paddington, and between Washington and Baltimore, have now grown into a vast web literally covering the civilized world, a network whose aggregate length is but little less than half a million of miles! "All the telegraphs known" were then scarcely half a dozen in number, and nothing can give so vivid an idea of the changes that have been wrought in telegraphy within a single generation, as a comparison of the unpretending work of Mr. Vail, with the elegantly printed, richly illustrated, and comprehensive epitome of the telegraph of to-day which Mr. Prescott has given us, containing descriptions and diagrams literally of hundreds of different systems or methods of telegraphy, in fact a veritable cyclopædia of the art and of the science on which it is based.

It is entirely within the limits of truth to say that the present work upon Electricity and the Telegraph is by far the most complete in every respect that has yet appeared in any language; for it not only contains, as it were, the condensed essence of its numerous predecessors, but it is brought down, with great fullness of description and illustration, to the very latest dates, so that we now have, for the first time, a well digested and permanent record of the brilliant telegraphic achievement of the last five years.

The subject as a whole is treated in such a manner as to naturally divide itself into three parts. The first part commences with an exposition of the nature, characteristics, and leading phenomena of frictional and voltaic electricity, and a description of the various voltaic combinations by which the latter is produced—a list which is by no means a short one, which is properly followed by chapters upon electro-magnetism, and also upon electro-magnetic, magneto-electric, and electro-static induction. The various apparatus for electrical measurement and their mode of application are then taken up and explained, after which comes a treatise upon the laws which govern the transmission of the electric current, prefatory to a full and complete exposition of the theory and practice of electrical measurement. The way is now clear for an explanation of the principles and practical arrangement of the telegraphic circuit, whether employed upon a land, a subterranean or a submarine line, which is given at considerable length and in a very careful and thorough manner, particular attention being paid to the subject of the retardation of signals arising from the effects of static induction, a matter which has now become of the highest practical importance.

The second part of the work is devoted principally to a description of the various systems of telegraphy now in use, and their almost innumerable modifications, together with the apparatus employed in each case. This is appropriately prefaced by a short account of some of the earlier experimental systems, which in some sense paved the way for others which are now in practical use. The Morse system is dwelt upon at considerable length, as its practical importance demands. The peculiarities of American and European practice are set forth in detail, and their relative advantages and disadvantages contrasted, and much information, both historical and practical, is given, for which the student will look elsewhere in vain. This is followed by a historical sketch and description of the English needle telegraph, which is traced up to its highest development in the syphon recorder of Sir William Thomson, of which, by the way, a fine engraving is given, so far as we know, for the first time. Then the dial instrument is taken up and described in all its modifications, followed by the type-printing system, which is its natural outgrowth. Elaborate and finely illustrated descriptions are given of the Hughes, combination, and Phelps electro-motor type-printers, that of the latter being especially interesting and valuable. The various stock and private line printers are not forgotten in this connection.

To most persons interested in the modern improvements by means of which telegraphic transmission is being so rapidly revolutionized, it is probable that the two hundred or more pages devoted to the automatic, autographic, duplex, quadruplex and harmonic systems will prove to be the most valuable portion of the whole work. The amount of information which is crowded into this space is certainly remarkable. There are no less than forty-eight illustrations of duplex and quadruplex apparatus alone, embracing many inventions that may be said to have been utterly unknown to most telegraphers. The plans, diagrams, and descriptions of the standard quadruplex of the Western Union company, are sufficiently full and minute to serve as a practical guide for setting up and managing the apparatus, and will be of the greatest practical value to the employés who are entrusted with the care of these instruments. The new system of the harmonic multiple transmission is well explained, as is also the telephone or talking telegraph of Prof. Bell, which is at present exciting so much attention, and the pneumatic tube system which has recently been introduced in New York is not overlooked.

The third part of the work is a practical treatise on the measurement and testing of telegraph lines, which contains in a compact and intelligible form just that knowledge which so many rising and ambitious young operators are anxious to acquire, and which will be of the greatest importance and value to them in the future.

We have aimed in the above hasty sketch, to give some idea of the actual contents of Mr. Prescott's work, but only a careful examination of the book itself can give any idea of the great amount of labor which must have been expended in condensing such a mass of information into the space of 978 pages. The mechanical execution of the book merits the highest praise. The illustrations, most of which were drawn and engraved expressly for the work, are of the highest order of excellence, and what is of equal importance, they have been printed on fine paper, with a degree of care which is too seldom exercised in works of this kind. The same typographical excellence characterizes the letter press throughout. Last but not least, the book is provided with a copious and well arranged index.

The most serious objection which can be brought against this book, in our opinion, is the extent of it, but as the price at which it is sold is scarcely more than half the amount usually charged for books of

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corresponding character and quality, we do not apprehend that its circulation will be materially restricted by that circumstance. It is a work which certainly ought to find a place in every telegraph office, not only in America, but abroad, and we trust that it may meet with that success to which its unquestionable merits justly entitle it.

TELEGRAPHIC COMPETITION.

Resources and Prospects of the Western Union and Atlantic and Pacific Telegraph Companies.

THE managers of the Atlantic and Pacific Telegraph Company, having made their usual semi-monthly announcement of a small reduction of telegraph charges over a limited extent of territory, to take effect March 1st, a reporter of the *New York Herald* proceeded to interview Mr. Orton, President of the Western Union Telegraph Company, as to the position which the company intended to take in regard to the proposed action of the former company.

In reply to his inquiries, Mr. Orton said:

To carry on the telegraphic business requires something more than a boastful prospectus. Mere proclamations on paper attacking a rival organization have no more effect than the Pope's bull against the comet. An organized telegraphic system is necessary, which no amount of money on hand can purchase. This system we have. The gentlemen who propose to parallel or, in a sense, to duplicate the lines of the Western Union Telegraph Company seem to ignore the essential element of time. The Western Union Company is twenty-five years old, and it has been growing every year since its foundation. I have been connected with the company for eleven years, during which its property has doubled and the volume of its business has increased more than threefold.

ITS PRESENT RESOURCES.

"Its carrying capacity has been more than quadrupled, and its rate of charges has been reduced fifty-two per cent. The Western Union Company has made more and greater reductions of rates on the average, without any competition, than all that have been made in consequence of competition. When I came into the business the rate between New York and San Francisco was $7 50, and between New York and points in Oregon and British Columbia it was from $9 to $10. The present maximum on the Western Union lines is $2 50, and the successive reductions to bring the rate to this figure have been made voluntarily by the Western Union Company, no one of them having been promoted by the acts of competitors. Now, how much the Western Union Company can be damaged by whatever increase of facilities it is possible for any other company to provide during the current year can only be ascertained by experience. It will not be unfair, however, to judge the future by the past. The gross receipts of the Western Union Company for the calendar year, 1876, were more than $10,000,000. The profits were nearly $3,500,000, and these items are larger than in any year since the corporation came into existence.

THE COMPANY'S GROWTH.

"The fact must not be overlooked that the Western Union company is a growing concern also, to a greater extent than its rival. We purchased from the manufacturers last year more than 6,000 miles of wire, all of which has been erected, and we acquired control by purchase and lease of about 4,000 miles more. In short, the growth of the Western Union is constantly greater than that of its rivals, so that the relative difference between its facilities and theirs has been greater every year since the beginning. How soon is it likely to be beaten in this race if it maintains, as is our determination, this rate of growth?

A FRUITFUL ILLUSTRATION.

"I have sometimes used this illustration in speaking of the threats of our rivals to duplicate our property. A person or firm has been in the nursery business for twenty-five years, and has on hand every variety of tree, shrub and flower of all ages, between one year and twenty-five. Such a one would not be likely to be very much alarmed at threats that his business was to be destroyed by a new man who had got unlimited prairie land and means to provide himself with seed. There would always be twenty-five years between the two concerns. I have always believed that the telegraphic business of this country could be profitably carried on at lower rates.

A COMPREHENSIVE REDUCTION RECOMMENDED.

"It is two years since, in one of my reports to our directors, I expressed the opinion that it would be practicable to have not more than four rates—twenty-five cents, fifty cents, seventy-five cents and one dollar—throughout the United States. As the volume of business increased, in order to do it as promptly as it was transacted before assuming such proportions, it was necessary to increase the carrying capacity of the lines. It is the policy of the Western Union to make this increase gradually, by making an appropriation each year of a portion of the profits accruing. It is the proceeds of these increased facilities that enables us to get a new dollar in place of the dollar drawn from us, either by competition or reduction of rates, or by both. For example, our company is now doing business at about 600 more stations than we had a year ago. Now, suppose that the receipts of these new stations average $10 a week each, that will bring in $6,000 a week in the aggregate, or $312,000 a year."

Atlantic and Pacific Telegraph.

WE wish we could be assured that the reorganization of the Atlantic and Pacific Telegraph Company and its project of spreading a network of rival wires all over the country are meant in good faith. It looks too much like a desperate scheme for practising on the fears of the Western Union and extorting a good round sum to buy off the threatened competition. It bears too many marks of a spurious movement. Whether it be intended to "bear" the Western Union stock with a view to enable the schemers to buy it low and then sell it at a great profit when they withdraw their opposition, or whether the object be to get an exorbitant price for a consolidation, or whether, as is more probable, it is sought to reap a harvest in both ways, it is too obvious that the senders of messages would be the ultimate victims. If the Western Union pays a heavy sum to buy off the schemers it will be obliged to reimburse itself in the prices of messages. If it should not raise its tariff of charges it would at least be prevented from reducing it with the growth of its business. The reason why the proposed extension of lines to minor points looks suspicious is that the business is obviously insufficient to support double lines, and that neither line could pay expenses at any reasonable rate for transmitting messages. The consequence would be that one company would be obliged, after a ruinous struggle, to make the best terms it could with its adversary, and the victor would then make up its losses out of the community. The Atlantic and Pacific Company has already lines between the cities which furnish business enough to justify competition, and if it extends a destructive competition to all the smaller stations it can be on no other sane calculation than that of either buying out or selling out, and saddling the community with the losses incurred in the struggle.—*New York Herald.*

The Telegraph.

THE ATLANTIC CABLE TELEGRAPHS.

Reduction of Rates by both Companies. Competition at the Expense of Stockholders. New Cable projects.

THE effort to effect an arrangement for combination of interests of the Anglo-American and Direct United States Cable Companies having failed, as stated in the last issue of the JOURNAL OF THE TELEGRAPH, an active competition has been inaugurated, and the matter has become one of indurance between the two companies. The Anglo-American managers announced several days ago a reduction, to take effect March 1st, of the rates over its lines to one shilling or 25 cents, per word. This has necessarily been met by the Direct Company by a similar reduction, so that after this date messages can be sent to Europe at rates which ought to be low enough to satisfy anybody. Of course if this rate is continued for any length of time, it will put a stop to dividends entirely, and the companies will be fortunate if, with all the business that can be transmitted over their cables, their receipts are sufficient to pay operating expenses and maintainance.

The party among the Shareholders of the Direct Company who desire to make an arrangement with the Anglo-American Company, are not disposed to submit quietly to their defeat, or to the ruling of the chairman by which the actual majority of votes was reduced to a minority.

In furtherance of the object of changing the control and policy of the company, a number of shareholders of the Direct United States Cable Company have sent a requisition to the directors, requesting them to convene an extraordinary general meeting for the purpose of increasing the number of the present directory. The requisition has been made in accordance with the 65th clause of the articles of association, which gives the company power from time to time to reduce or increase the number of its directors. Legal proceedings have also been taken to compel the directors to receive the votes of those of the shareholders to which objection was taken on the alleged ground that they were merely nominal holders of shares.

The discussion of Atlantic Cable matters has brought to the surface several schemes for new cables which have been in abeyance for some time past. The act which was recently passed by Congress authorizing the laying of a cable from Baltimore has been signed by the President. As the cable if ever laid under the provisions of this act, would be at least 5000 miles long, and the charge is limited to a maximum of 25 cents a word, the prospect for laying or working it does not appear to be very brilliant. Another cable project is reported from Canada under the auspices of Dr. Fortin, and the projected new French Atlantic Cable has not been abandoned. When all these cables are laid, and in operation, the public will undoubtedly be well served, and the capitalists who furnish the money for them can reckon upon a permanent and unremunerative investment.

The Exclusive Rights of the Anglo-American Telegraph Company in Newfoundland Sustained.

THE Judicial Committee of the Privy Council, the highest court in England, on the appeal of the Direct United States Cable Company, respecting the laying of their cable off the coast of Newfoundland, within the limits to which an exclusive right is claimed by the Anglo-American Telegraph Company, gave judgment Feb. 14th. The appeal was dismissed with costs, thus confirming the exclusive right of the Anglo-American company to lay and maintain cables on the coasts of Newfoundland, under the grant of the Province to the original company.

Atlantic and Pacific Telegraph Company Directors Elected. Three Millions Stock to be Issued.

A meeting of the Trustees of the Atlantic and Pacific Telegraph Company was held on the 19th inst., at which the following gentlemen were elected to fill vacancies in the board. J. W. Garrett, Thos. A. Scott, Hugh J. Jewitt, C. K. Garrison, and James R. Keene.

Mr. Garrett has since declined, and Mr. Scott had not accepted at the time this is written, and it is understood one or two others either have or will decline the honor with thanks.

At the same meeting resolutions were adopted au

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thorizing the issue of $3,000,000 additional stock, at 20 per cent. of its par value, with the proceeds of which it is proposed to further extend the lines of the company. When this stock is issued the capital of the company will be $15,000,000, or nearly one half as much as the outstanding capital of the Western Union Telegraph Company.

Annual Meeting of the Dominion Telegraph Company.

The annual meeting of the Dominion Telegraph Company of Canada was held at Toronto, Feby. 6

The report states that 300 miles of line were completed in the maritime provinces last year, and eleven offices have been opened there. It appears that an agreement has been ratified with the Direct Cable Co., that in case that company shall, from amalgamation or from any cause, be compelled to break its original contract with the Dominion Co., the latter shall be paid $150,000, the estimated cost of its connecting wires. A slight increase in the traffic receipts for the year is announced, as also a small decrease in the working expenses; and after declaring two dividends, equal to six per cent. for the year, a balance af $3,359,16 is carried to the credit of profit and loss.

Quick Telegraphing.

On Wednesday John B. Gibson, manager of the Western Union Telegraph in this city, made the following record in sending a telegram to Paris, Ky., and receiving and delivering the answer:

Dispatch received at	10:43
Sent at	10:44
Answer received at	10:48
Delivered at	10:49

Making six minutes from the time the dispatch was handed to him until the answer was delivered to the sender. That's "lightning" time for a certainty.—*Maysville Republican.*

CONSOLIDATION RUMORS.

No Funds of the National Telegraph Company Discernable.

A San Francisco, Cal., Associated Press dispatch of the 9th February, stated that the rumor of the consolidation of the Atlantic and Pacific Telegraph Company with the National Telegraph Company, of San Francisco, is generally considered there as a stock jobbing dodge. Inquiry at the Bank of California fails to elicit whether the latter company has any funds to its credit there. The records of the County Clerk's office show that that company was incorporated with $25,000,000 capital, of which $7,500,000 were subscribed, and ten per cent. of the subscribed capital was alleged to have been paid in. Where that amount is, or what has been done with it, cannot be ascertained.

Albany, N. Y., and Vicinity Telegraphic Notes

The increase of business on the Albany and New York quad., during January, 1877, over the same last year, was 1,441 messages. During the year 1876, the quad. record shows the total number of messages exchanged between Albany and New York (main office) to have been 138,837. The largest month was August, during which nearly 17,000 messages were exchanged. The largest day was Sept. 18th, which footed up 1,159 messages.

The new pole-changers, which have recently been placed in circuit on the New York quad, and the Boston and Buffalo quad repeater, are a great improvement on anything we have yet seen.

There appears to be quite a lively scramble after the vacant position on the Fire Alarm Telegraph force, caused by the death of Prof. John H. Nelson. As near as we can learn there are four applications now pending before the Board of Fire Commissioners. Each of the applicants is sure that he will receive the appointment. Among them are, at least, two Western Union employés.

Personal.

The Telegraphers of West Division, L. S. and M. S. Ry., regret to learn of the resignation of H. W. Miller, as agent and operator at Whiting. After being with them for four years, he leaves for a protracted tour through the West, perhaps not to return. Mr. Miller has many friends on the line who wish him a pleasant journey, and prosperity wherever he may go.

Mr. J. W. Haynes has been appointed Sup't of Telegraph for the Paris and Danville R. R. vice Mr. G. H. Cooper resigned.

Annual Reception of the Chicago, Ill., Telegraphers.

The Annual Reception and Ball of the Chicago Ill., Telegraphers, took place at Martine's West Side Hall, on the evening of February 12th, and was in every respect a complete success. About 150 couples were present, and appeared to thoroughly enjoy the entertainment.

One of the features of the evening was the playing of a waltz, composed for the occasion by Mr. Fred. Root, by Mr. Gray's Telephone, or Electric-Harmonic apparatus, the player manipulating the keys in the Western Union main office.

A number of invited guests from other places were present, and during the evening fraternal and kindly greetings and messages were received by telegraph.

At midnight supper was served, and was thoroughly enjoyed by all present.

Among the prominent persons present were Gen'l Anson Stager, Vice-President and General Sup't W U. Tel. Co., and Judge Caton.

The local telegraphers attended in larger numbers than at any previous similar entertainment, and all present united in the opinion that the reception was not only a marked success, but highly creditable to the telegraphic fraternity, and especially to those who were actively engaged in getting up and managing it.

The Chicago Electrical Society.

The regular monthly meeting of the Chicago Electrical Society, was held Feb. 15, at the rooms of the Society. The meeting was an interesting one, and was well attended several ladies being present, and assisting.

The proceedings comprised music, the reading of a paper on "Electric Force," experimentally illustrated, by Mr. F. W. Jones; and a short paper on the "Education of Telegraphers," by Mr. W. C. Long.

Brief remarks followed from members present, after which the meeting adjourned.

Brief Mention.

A telegraph line is now being constructed between Lake George and Chubb's Dock, a station on the shore of Lake Champlain, located on the line of the New York and Canada Railroad. The wires will be strung over the Dresden Mountains.

An office has been opened on the U. S. Military Telegraph line, Texas Division, at Henrietta, Texas. Tariff, via Denison, Texas, 25 and 1.

A Boston merchant recently telegraphed to Calcutta at five o'clock in the afternoon, ordering the purchase of merchandise to the amount of $100,000. The following morning at nine o'clock a response to the merchant's order was in his counting-room, stating prices, rates of freight, and other facts.—*Boston Advertiser.*

Mr. John Nadin, the telegraph operator at Osborn, Ohio, has been presented with an elegant revolver by the young ladies of that place, for his gallantry in rescuing a lady from the attacks of three scoundrels, recently.

Sumner Wheeler, the young man who killed Frank Carpenter with a base ball club, while in a quarrel in a telegraph office at Big Rapids, Mich., in December last, has been sentenced to five years and six months hard labor in the Penitentiary.

An electric battery, famous because it was once owned and operated by Benjamin Franklin, and other distinguished scientific men, has been in constant use at Dartmouth College for years, and is now employed almost daily for class-room experiments in physics. It was at one time in the hands of the celebrated Dr. Priestly, the discoverer of oxygen.

Correspondence.

Simplification in Treating of Electrical Science desirable.

To the Editor of the Journal of the Telegraph.

The article on Atmospheric Electricity, in a late number of the Journal of the Telegraph, revives an idea that arises in my mind whenever I read similar descriptions of electrical phenomena. It frequently occurs to me that the study of electricity would be greatly simplified, and a good knowledge of the science more easily acquired, were its actions described just as they appear in practice, and not according to the conventional method followed by nearly all writers on the subject.

In the article it is stated "the negative charge * * * is derived from the earth" and "the negative electricity is attracted to the parts A B:" in the books it is common to find such expressions as "negative current," "negative electricity," "negative electricity flows," "send a zinc current to line," etc., etc. These and like expressions lead the student to think that electricity is a fluid or some kind of matter, and therefore that negative electricity flows or is attracted and that he can send a negative current; whereas there is no evidence as to the nature of electricity, and there is daily proof that a zinc current cannot be sent to line or anywhere else, and that in the place to which "negative electricity has been attracted" there is a vacuum, so to speak, or a want of electricity. This kind of writing is, I submit, not only objectionable, but injurious, because to understand the phenomena one has to be aware and to keep it well in mind that such expressions or phrases are merely conventional; one must remember what Jenkin says, that "there is no difference between saying negative electricity passes from the rubber to the ground, and positive electricity flows from the ground to the rubber." There may be no difference to Mr. Jenkin and others, but to the ordinary mind it would appear to be much better to say, just what takes place, that a positive current flows from the ground to the rubber in the case of the machine, and from the ground to the zinc in the case of the battery; that natural electricity is repelled from the parts A B to the remote parts D C, which parts and other parts and things become negative or positive according as they have less or more electricity than their natural share; and that currents are positive or negative as they may be receding or approaching one, etc., etc.

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I might prolong this communication by numerous other examples, but my object (which, be it remembered, is not to find fault or to criticise) is to call attention to what has long appeared to be a want in the school literature of the science of electricity, or at least of the art of telegraphy, and what is said above so poorly may be a help towards that end.

F.

A fire in a Telegraph Office. Gallant conduct of the Employes. Personal experience.

TOLEDO, OHIO. *Feb.* 23.

To the Editor of the Journal of the Telegraph.

DID you ever notice how, in times of great peril or excitement, brave men come to the front? Why, of course you have. I was about to ask, "were you ever at a fire"? but I mean was a fire ever at you? that's the idea; well if you've "been there," you know just how excited every one got *except yourself*. Certainly; and still every one else thinks every other body is the excited one.

Its the same here. We had one. It was just about one o'clock in the afternoon, when one of the boys said, "'Pears to me I smell pine smoke". The same idea struck all of us at once, and it came near knocking us all down stairs at once, too. A second later and Stevens, one of our repairers who was in the battery, rushed down the stairs yelling "Fire! Fire!! Fi-i-i-e-r!!! Two seconds later and our noble force viewed the burning building from the side-walk. Where all did so well (in getting out) it would be hard and unjust to particularize; but as we talked the matter over afterwards, each man's story did'nt exactly coincide with his actions:—hence these few lines.

Mr. C. O. Brigham, our worthy chief operator, was at dinner when the alarm was sounded, and, although he made splendid time, when he reached the operating room he found himself "monarch of all he surveyed."

The men, the men, oh! where are they? he cried;
Have they gone and fought the flames and died?
"Nay, nay," quoth echo, with its answering roar,
"You'l find 'em over yonder at that corner store,
Where they, with features of sardonic grin,
Thank the bright stars that *they* are out
If you *are* in."
"Then over there I'll go and fetch em."
"Yes," said a fireman, "but first please ketch 'em."

"Its all well enough" said Mr. Davis, placing his hands patronizingly beneath his coat tails, and allowing the genial warmth to permeate his frame; "Its all well enough, you know, to *talk* about 'presence of mind,' 'personal bravery,' and this 'stand firm business' when every thing is *lovely*. But, when a building is on fire, *its on fire*, you know, and it behooves a man to gently fade down the stairway, ere he becomes short circuited, as it were, and the mercury shows 152 in the office thermometer." "Yes" chimed in Church, who is newly married; "of course a fellow thinks of his family and all that, and while its true the company might compensate the widow handsomely in case of loss of life in their service, and while this would doubtless be consoling to her, I don't think it would help the deceased husband's frame of mind any. Yet at the same time, *presence* of mind is a thing I go in on to my last button. In fact, it was my devotion to that idea which caused me to glide gracefully earthward. My mind was on the sidewalk, and I proposed to be with it as speedily as possible."

Mr. Taltavall (John is poetic) said, "my feelings were as placid as a frozen lake by moon-light.

He was in no hurry at all. He was bound to save something, and he thought he'd save his presence, which he did, yet not utterly unmindful of the immense destruction of property likely to ensue, he had snatched as a brand from the burning, a valuable instrument, in fact, the Tangent Galvanometer. When called upon to produce it, John with extreme modesty withdrew from his pants pocket an article which upon close inspection proved to be a switch board plug. John remembered just then, that he was wanted at his table.

Mr. Clohisy, with that cool, pleasant calmness that always seizes one as he sits in a chair preparatory to having three teeth pulled, merged himself with his silk umbrella and, Elijah-like, was lost to view with a suddenness. Thompson wasn't excited; you should have seen him, after the fire, as he leaned against the mantel piece and remarked "*Never* be in a hurry. Take your time. There's no use of losing your head, you know". Certainly not. Of course not. But when Ben asked his wife to fix his suspender buttons on, and told her she would find the buttons in the pockets, and she commenced pulling out rheostat plugs, thumbscrews, key buttons, sounder levers, insulated wire, red blanks, letter clips and blue vitriol, she merely remarked, "well, when I see Mrs. Selden (and I know she'll tell me *her* husband was cool and collected as an iceberg) I shall observe, that probably Ben wanted to preserve a few things *merely as mementoes*." Thompson says the way Mr. S. grabbed the single transmitter on the quad by the thumbscrews, and then violently let go of it, and was next found at a drygoods store, where he said he "was hunting for *plyers*," and who then gallantly rushed to the water works, distant three miles, to tell them to "put on more pressure, double the quantity, increase the tension regardless of the conductivity of the hose", and was then taken in charge, he *was* cool; they had ice on his head. Charley Stowe, our check boy, oscillated like a pendulum between his overcoat and lunch basket for a time and then lunch won the day, and the decline in bread stuffs was lively. D. S.

Speed of Transmission over Submarine Cables.

WASHINGTON, PA., *Feby.* 22.

To the Editor of the Journal of the Telegraph.

SEEING many questions and answers in the JOURNAL OF THE TELEGRAPH, I would crave an answer to one or two in regard to the cable business. How fast they transmit business, etc.?

GEO. W. KIRK.

Our correspondent is rather indefinite in his inquiries except upon one point. The speed of transmission on submarine telegraph cables varies according to the length of the circuit, and the character of the conducting wire. Upon some long cables it is not more than 8 to 12 words per minute, while on others of less length and greater conductivity it reaches 15 to 17 words per minute. The Duxbury and St. Pierre cable, which is about 850 miles long, can be worked up to nearly or quite 30 words per minute.

Inventions.

UNDER THIS HEAD THE TITLES OF ALL ELECTRICAL AND TELEGRAPHIC PATENTS ISSUED FROM THE UNITED STATES PATENT OFFICE WILL BE PRINTED, AND THE CLAIMS OF ALL TELEGRAPH PATENTS IN FULL.

For the week ended January 2, 1877, *and bearing that date.*

185,841.—MULTIPLE CIRCUIT-CLOSERS FOR ELECTRIC CIRCUITS. J. H. Striedinger, New York, and A. Doerflinger, Brooklyn, N. Y. [Filed Nov. 24, 1876.]

1. In a circuit-closer, the combination of a series of conductors, *a*, *b*, and *c*, terminating in metallic points A, B, and C, with a movable plate, and with the cups A* B*, &c., and conductors *a** *b**, &c., all arranged to effect a simultaneous closing of a series of circuits, substantially as specified.

2. The combination of the independent actuating-circuit *f g* with the suspending device H, and circuit-closing plate E, all arranged so that by closing the actuating circuit *f g* the main circuit or circuits will also be closed, substantially as specified.

For the week ended January 16, 1877, *and bearing that date.*

186,330.—ACOUSTIC ELECTRIC TELEGRAPHS.—T. A. Edison, Menlo Park, N. J., assignor to the Western Union Telegraph Company. [Filed May 16, 1876.]

1.—The main battery M B, and short circuiting connection *x*, both between the line and the earth, in combination with a series of reeds or vibrating transmitting instruments, and contact points opened and closed by the reeds, substantially as set forth.

2.—The magnets m m', vibrating reed B, circuit closers *g* and *h*, local battery *n'*, and connections arranged substantially as set forth, whereby the circuits, through the respective magnets, are entirely broken alternately by the vibrations of the reed, as specified.

3.—The combination, with a polarized vibrating reed, of an electro-magnet and circuits, substantially as set forth, whereby currents of alternating polarity are passed through the electro-magnet by the circuit-closers that are operated by the reed, substantially as set forth.

4.—The combination, with the main battery and shunt between the line and earth, reeds, and contact points, operated by such reeds, of finger keys placed in short circuits around the circuit-closing points, substantially as set forth.

5.—In an acoustic telegraph receiving instrument, the combination, with the receiving magnet, of a condenser, in a shunt around such magnet substantially as set forth.

6.—The combination, with the reed 9, of the levers 10 and 11, contact points, local circuit, and receiving magnet or sounder 8, substantially as set forth.

7.—The magnets 12 and 13, at opposite sides of the vibrating reed, and in the main-line circuit, with tubes around the cores of one of the magnets, for the purposes set forth.

8.—The magnet 15, with its cores in branches of the main line, in combination with the polarized reed induction magnet 14, and resistance R', substantially as set forth.

OBITUARY.

Joseph Knox.

JOSEPH KNOX, who had been engaged in the manufacture of Electrical and Telegraphic apparatus in Philadelphia for 40 years, the last 28 of which as the senior partner of the well known firm of Knox and Shain, died in that city Feb. 14, 1877, aged 72 years. Mr. Knox was regarded as one of the best practical mechanics in the country, and was highly esteemed in all the relations of life.

MARRIED.

LYON—PRIOR.—At the residence of the bride's parents, Columbus, Georgia, February 14, 1877, GEORGE A. LYON, repairer Western Union Telegraph Company, Opelika, Ala., to Miss MARY PRIOR.

BORN.

NEAL.—At Searcy, Arkansas, Feb. 14, 1877, a boy, to A. E. NEAL, Manager Western Union Telegraph. He has been named L. C. NEAL, after the District Superintendent.

DIED.

CHESTER.—On the night of Feb. 13, 1877, at Elizabeth, N. J., of bronchitis, FANNIE A., daughter of Walter Harris, and widow of the late John N. Chester of New York.

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
New York, March 1, 1877.

To all offices on Western Union Lines:

The following changes and additions have been made since the date of the last circular:

ATLANTIC CABLE.

REDUCTION IN RATES.

On and after March 1, 1875, the tariff for Atlantic Cable messages to Great Britain, Ireland, and France, will be as follows;

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	For each word, IN GOLD.
From New York City, the New England States, Nova Scotia and New Brunswick	$0.25
From New York (except New York City), New Jersey, Pennsylvania, Delaware, Maryland, and District of Columbia.	$.28
From West Virginia, Ohio, Michigan, Indiana, Kentucky, Illinois, and from Milwaukee, in Wisconsin, and St. Louis, in Missouri	$.35
From Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Wisconsin, (except Milwaukee), and from Western Union offices in Florida	$.40
From all points in Texas, Arkansas, Missouri (except St. Louis), Kansas, Nebraska, Iowa, Minnesota, Colorado, Dacotah, Wyoming, New Mexico, Utah, Idaho, Montana, Nevada, California, Arizona, Oregon, and Washington Territory	$. 45
From British Columbia	$.60

GENERAL INFORMATION.

Fairfield, Cal., should read Fairfield Sta.

* Glenbrook, Lake Co., Cal., reopened. 58 129 Colusa.

Lincoln, Cal., closed.

* Mountain View, Cal., is now a W. Union office.

* Saratega Springs, Cal., closed.

* Valley Ford, Cal., is now a W. Union office.

Sparta, Ga., closed.

Greenbush, Mich., closed.

Union Mills, Ind., reopened.

The P. O. address of Canton, Ky., is Visalia.

399 Ozark, Phelps Co., Mo., reopened. P. O. A. Ozark Iron Works.

Junction, N. Y., will hereafter be known as Cooperstown Junction.

Ioano, Nev., closed.

Eagle Village, N. Y., closed.

* Fort Jackson, N, Y., closed.

* Fort Ticonderoga, N. Y., closed.

Machias, N. Y.. Closed.

Messages for Cape Canso and Guysboro, N. S., will hereafter be transferred to other lines at Halifax. Tariff for other lines 30 and 2. Messages must be pre-paid.

* Thornport, O., closed.

* Carlisle, Ont., reopened.

* Skeads Mills, Ont., closed.

The P. O. A. of Allegheny Junction, Pa., is Allegheny Junction, care of Lucesco.

Messages taken for Portage Station, Pa., are delivered from Sonman. Charges for delivery, 15 cents.

* Bergerville, Que., closed.
* Cacouna Station, " closed.
* Cape Rouge " closed,
* Carillon Wharf, " closed.
* Grenville Wharf " closed.
* Indian Cave, " closed.
* Mill Cove, " closed.
* Murray Bay Wharf, " closed.
* Paboe Mills, " closed.
* Point Platon, " closed.
* Point au Pic, " closed.
* Sandy Bay, " closed.
* Salmon Lake, " closed.
* West Shefford, " closed.

Liberty, Texas, closed.

Messages taken for Marshfield Village, Vt., are delivered from Marshfield Depot. Charges for delivery, 25 cents.

Boston, Va., should read South Boston, and is in Halifax Co. P. O. A. is South Boston Depot.

Salem, Va., is in Roanoke, Co.

Utsalady, Washington Terr., closed.

NEW OFFICES.

Courtland, Cal.
* Fairfield Village, Cal., 15 5 Suisun.
Galt, Cal.
* Port Kenyon, Cal., 115 58 Petaluma.
218 Tifton, Ga,
308 Seymour, Ill.
Crums Point, Ind.
271 Hillisburg, Ind.
Morrice, Ind.
272 Scipio, Ind.
407 Ewart, Iowa.
407 Montezuma, Iowa.
21 North Billinca, Mass.
* Greenville, Miss., 75 5 Vicksburg.
52 Martins Creek, N. J.
92 Orleans, N. Y.
74 Elbridge, N. Y.
* Dartmouth, N. S.. 30 2 Halifax.
* Tor Bay, N. S., 30 2 Halifax.
* Waverly, N. S., 30 2 Halifax.
242 Arcanum, O.
150 Dorset, O.
* Keswick, Ont.
* New Albany, Pa., 25 2 Towanda.
59 Torresdale, Pa.
* Grand Ligne, Que.
35 Groton. Vt.
35 Marshfield Depot, Vt.
35 Peabody Sta., Vt.
35 Plainfield, Vt.

OFFICES HAVING SPECIAL SHEET "H"

Will add the following to the list of sheet "H" offices.
Jeffersonville, Ind.
Louisville, Ky.
New Albany, Ind.

Senders of cable messages should be notified that they may secure free transmission of the address of a cable message to Europe by having the address of their correspondent registered.

The registration of the address will be made by telegraph to all stations in Great Britain and Ireland, and by telegraph to London, and thence by mail to stations in Europe.

A registered address should contain two words: the first, the name of the person or firm to which the message is to be sent (this may be either the name of such person or firm, or a code word representing the same); the second *must* be the name of the "place to" or destination.

The form of a request for a registration of address is as follows:

NEW YORK, March 1, 1877.

To.....Supt.

Please register the word "Negus" for John Harrison & Co., No. 137 Mincing Lane, London, for cable message by the cable of the Anglo-American Tel.. Co, from and to Brown & Co., 25 Clark street, New York.

.....Office.

(If messages are to pass but one way, the form should be changed from "*from and to*," to "*from*" only or "*to*" only), as the case may be.

In the example given messages between the firms if *from* London will come addressed "Negus, New York." If *to* London they will be addressed "Negus, London."

The two words forming the registered address of a person or firm in Great Britain, Ireland or France will be transmitted free to destination. The registered address of a person or firm in Europe beyond France will be transmitted free only as far as London or France.

In unregistered addresses the "place to" will in all cases be transmitted free as far as London or France.

We are notified that the Saigon Hong Kong cable is interrupted. During the interruption messages for China and Japan will be forwarded *via* Siberia.

The cable between Singapore and Batavia is also interrupted. During the interruption messages will be forwarded by steamers which frequently pass between Singapore and Batavia.

WILLIAM ORTON,
President.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 93.

NEW YORK, March 1, 1877.

MISS FRANCES J. JONES.

MISS FRANCES J. JONES died of consumption, at Chester, Pa., February 9, 1877. Her certificate, No. 2024, was issued May 21, 1873.

MISS JONES is the third lady member who has died since the Association was organized. Let payment of this assessment be made *promptly* and cheerfully.

The claim of Mr. Alexander Farquhar, mentioned in notice of assessment of December 30, 1876, has since been fully sub stantiated, and has been paid from funds on hand, and no assessment will be made therefor.

It is expected that the next claim will be paid from surplus accumulating from assessment 89 90 91 92 and 93, and that no assessment will be necessary.

One dollar is due for assessment 93 from members holding certificates numbered up to and including No. 2870.

Members who have not remitted for assessments 91 and 92, of February, 1, 1877, will please consider this a duplicate notice that such assessments are due, and should be paid at once to prevent loss of membership.

A revised ist of the Agents of the Association will be published with next assessment notice.

RECEIPT OF ASSESSMENTS.

February 24, 1877.

ASSESSMENT No. 89.

2115 2411 2459.

ASSESSMENT No. 90.

39 51 84 171 178 206 237 238 242 246 248 252 258 316 411 412 414 429 451 453 455 457 491 499 503 503 507 527 545 573 597 610 652 712 725 730 731 734 783 801 812 821 858 869 899 904 920 926 938 1002 1041 1063 1104 1105 1107 1108. 1109 1110 1112 1113 1115 1117 1120 1122 1123 1125 1131 1141 1108 1283 1286 1270 1336 1385 1428 1437 1497 1511 1529 1530 1553 1559 1600 1603 1610 1611 1512 1619 1637 1639 1676 1690 1691 1692 1731 1750 1751 1753 1754 1755 1756 1757 1759 1760 1769 1771 1786 1802 1813 1828 1838 1863 1877 1895 1906 1944 1958 1968 1974 1976 1978 2019 2035 2037 2052 2095 2112 2118 2132 2138 2154 2162 2171 2177 2227 2266 2267 2292 2300 2301 2319 2320 2324 2328 2330 2331 2333 2334 2353 2368 2369 2382 2401 2404 2405 2406 2407 2408 2409 2410 2428 2432 2453 2446 2447 2450 2453 2465 2504 2512 2520 2522 2527 2529 2541 2549 2562 2563 2664 2565 2577 2585 2586 2587 2588 2589 2590 2592 2602 2656 2672 2673 2676 2678 2685 2688 2703 2707 2709 2713 2732 2777 2778 2779 2781 2793.

ASSESSMENT No. 91.

13 182 1786 2726.

ASSESSMENT No. 92.

16 19 23 25 38 46 59 67 72 89 99 140 141 142 143 144 169 172 176 177 183 184 201 202 220 230 254 276 278 279 280 281 282 283 285 286 289 302 312 344 350 352 361 372 378 379 385 392 393 394 431 438 464 496 497 505 508 509 516 532 533 535 547 554 564 575 587 603 617 649 662 663 664 665 669 672 678 680 685 701 708 710 721 722 729 742 750 751 756 791 800 808 832 836 843 855 874 886 901 915 916 922 929 932 934 941 952 976 978 980 1000 1011 1023 1024 1047 1038 1090 1126 1143 1144 1147 1153 1154 1196 1199 1200 1233 1251 1255 1276 1288 1289 1339 1340 1342 1346 1348 1349 1350 1351 1364 1365 1366 1390 1391 1398 1405 1407 1427 1430 1440 1444 1454 1455 1456 1476 1481 1482 1484 1506 1507 1508 1513 1518 1522 1524 1527 1555 1560 1582 1586 1590 1605 1607 1608 1616 1628 1630 1634 1635 1653 1655 1656 1658 1697 1698 1707 1708 1713 1721 1729 1810 1811 1812 1815 1816 1835 1841 1852 1862 1934 1960 1951 1953 1957 1964 1969 1901 1909 2000 2001 2023 2024 2028 2030 2040 2044 2046 2057 2066 2089 2113 2135 2145 2170 2172 2175 2181 2187 2199 2204 2205 2206 2212 2243 2293 2295 2296 2297 2298 2305 2309 2314 2316 2317 2321 2343 2360 2372 2374 2375 2592 2393 2395 2413 2419 2421 2425 2441 2442 2449 2461 2462 2463 2468 2470 2478 2479 2484 2486 2497 2500 2509 2511 2515 2524 2525 2526 2534 2538 2542 2543 2547 2550 2557 2559 2560 2570 2593 2600 2606 2610 2611 2612 2619 2629 2636 2637 2642 2646 2947 2650 2651 2652 2653 2655 2659 2661 2562 2663 2687 2668 2669 2674 2680 3682 2683 2686 2687 2694 2698 2699 2700 2705 2706 2710 2711 2712 2714 2724 2727 2728 2730 2731 2733 2734 2735 2836 2738 2743 2749 2750 2751 2752 2756 2758 2760 2780 2784 2785 2794 2805 2807 2820 2823 2827 2828 2833 2837 2838 2839 2841 2849 2858.

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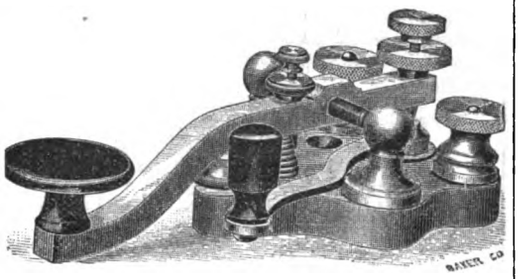

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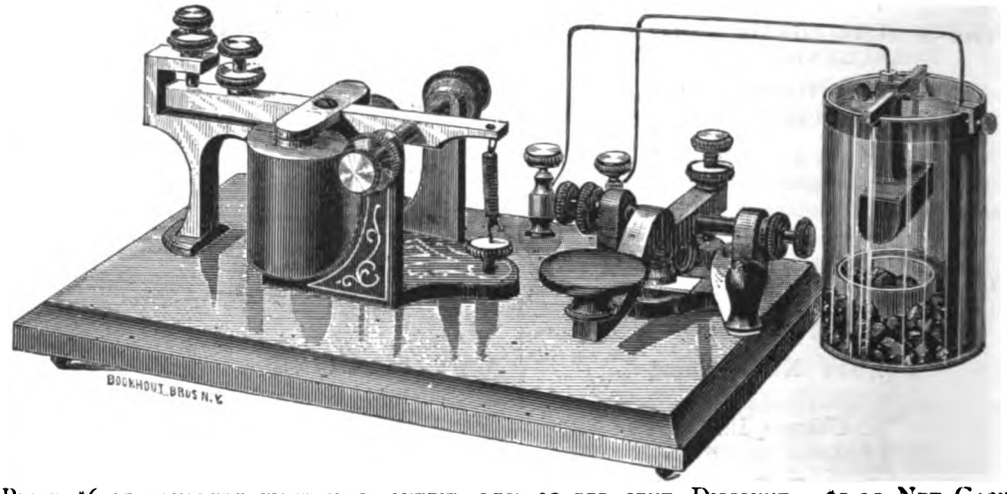

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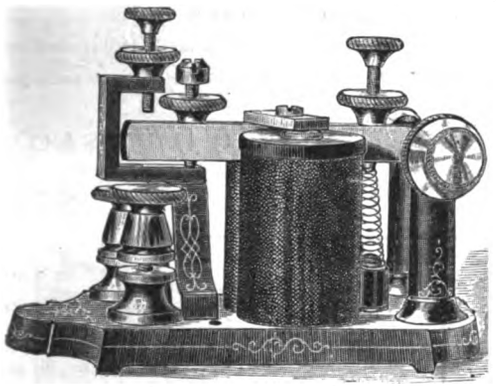

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G. A. STIMPSON, Western Union Telegraph Building, New York, will furnish the Western Union Telegraph Company's pany's Cable Charts, colored, on rollers, and also in book or pocket form. Price, $1.50.

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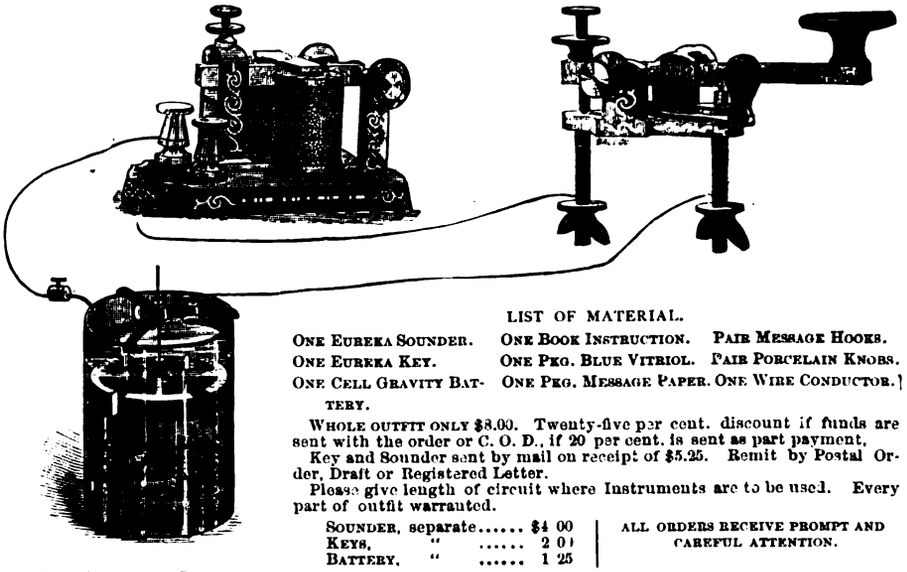
THE EUREKA OUTFIT.

The best Outfit ever offered for Home and Office use.

Price $8.00, 25 per cent. discount for cash orders.



LIST OF MATERIAL.

ONE EUREKA SOUNDER.	ONE BOOK INSTRUCTION.	PAIR MESSAGE HOOKS.
ONE EUREKA KEY.	ONE PKG. BLUE VITRIOL.	PAIR PORCELAIN KNOBS.
ONE CELL GRAVITY BATTERY.	ONE PKG. MESSAGE PAPER.	ONE WIRE CONDUCTOR.

WHOLE OUTFIT ONLY $8.00. Twenty-five per cent. discount if funds are sent with the order or C. O. D., if 20 per cent. is sent as part payment.
Key and Sounder sent by mail on receipt of $5.25. Remit by Postal Order, Draft or Registered Letter.
Please give length of circuit where Instruments are to be used. Every part of outfit warranted.

SOUNDER, separate.....	$4 00	ALL ORDERS RECEIVE PROMPT AND CAREFUL ATTENTION.
KEYS, "	2 00	
BATTERY, "	1 25	

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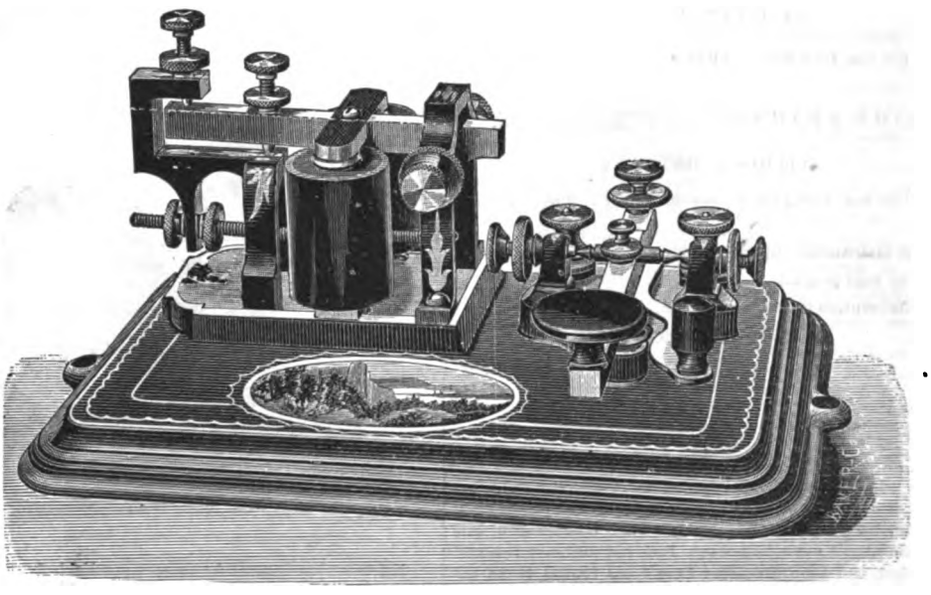
220 Kinzie Street, Chicago, Ill.

CELEBRATED PRIVATE LINE OUTFIT.

The complete outfit includes one Private Line Instrument, one Cell Bliss Reservoir Battery, the necessary Chemicals, Wire for Connections, and a Manual.



Our Private Line Instrument, as now manufactured, is a perfect beauty, and fit for a parlor ornament. It will work on a line from a few feet to ten miles in length.

In ordering give the length of the line, so that the resistance of the magnets may be rightly proportioned.

The Bliss Reservoir Battery is not excelled for force, constancy and economy.

Private Line Outfit complete, ...	$10 00
" " Instrument, ...	8 00
Bliss Reservoir Battery, per cell, ...	2 00

☞20 per cent. discount is allowed when cash accompanies the order.☜

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Having for several years been engaged in the manufacture of PRINTING AND DIAL TELEGRAPH INSTRUMENTS for PRIVATE AND SHORT LINES, we have brought them to a high state of perfection.

Many improvements in these instruments have been made and patented during the last few years, which have added largely to their simplicity, reliability and value.

These instruments can be operated by any person of ordinary intelligence, with a few minutes' instruction, and are not liable to get out of order.

They have been extensively introduced in this city and elsewhere, and complete satisfaction is guaranted to purchasers.

This company is also engaged in the construction of

PRIVATE TELEGRAPH LINES,

which are put up in the best and most substantial manner, and upon very reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employes, etc., for the introduction of these instruments.

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JOSEPH MOORE & SONS,

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WIRES OF EVERY VARIETY OF INSULATION

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WITHOUT BATTERY.

Sent by mail POST PAID to any part of the United States, $4 75.

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See description in another column.

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PRICE, 25 Cents.

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Send orders early. Satisfaction guaranteed.

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(ESTABLISHED IN 1856.)

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COPPER AND GERMAN SILVER in roll and sheet.

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WESTERN ELECTRIC MANUFAC. CO.,

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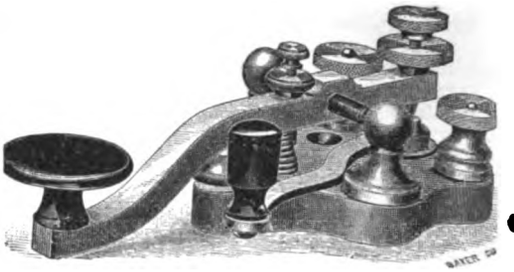

PATENT LEGLESS KEY.

All the connections in this Key are on the top of the table.

It is not equaled for beauty of design, perfection of finish and completeness in its parts.

It is convenient and durable.

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Prices always as low as the lowest.

The usual twenty per cent. discount is still allowed on Instruments of our manufacture, when remittance accompanies order.

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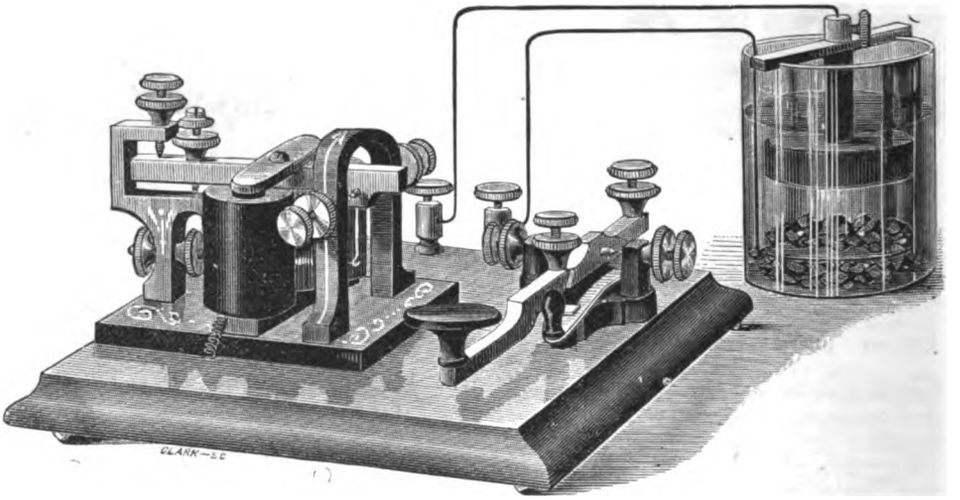
$5.00 ONLY, PREMIUM LEARNER. ONLY $5.00



Knowing the demand for cheap and reliable Learners' Apparatus we have put forward the above PREMIUM INSTRUMENT at the remarkably low price of $5.00 when the money accompanies the order.

This OUTFIT comprises our FAMOUS GIANT SOUNDER AND NEW CURVED KEY, all full sized, (the same as those upon which the premium was awarded at the Centennial Exhibition) all substantially made, and placed upon a finely polished mahogany base, together with one cell of Callaud Battery, office wire, chemicals and an excellent book of instructions. Boxed and shipped upon receipt of $5.00.

We guarantee the instrument and outfit superior to any other ever offered to the public for the price, or money refunded

PRICES:

Complete outfit, $3.25; Cash in advance, $5.00. Instrument without Battery, $5.25; Cash in advance, $4.20

Instrument without Battery, wound with fine wire for lines one to fifteen miles, $6.25; Cash in advance, $5.00

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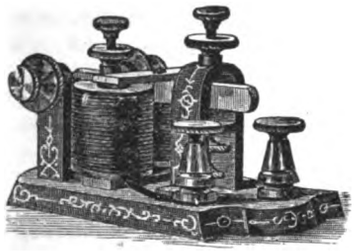
A GREAT REDUCTION IN PRICES.

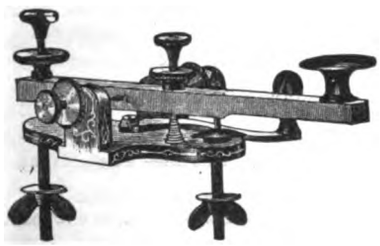
The unequalled "PHIL SHERIDAN" Telegraph Instrument.

$6.50 Complete Outfit for Office or Learners.



The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50 cents Extra.



You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustment, etc. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

List of material which accompanies complete outfit.

1 SOUNDER, 1 FULL SIZED BATTERY,
1 LB. BLUE VITRIOL, 1 BOOK OF INSTRUCTIONS,
1 KEY, 1 DOUBLE CONNECTOR,
1 ROLL WIRE.

Price, by Express, C. O. D..... $7.00
When cash is sent with the order..... 6.50
Phil. Sheridan Sounder, separate..... 4.00
Phil. Sheridan Key, separate..... 2.00
Battery..... 1.45

Money should be sent either by bank draft, Post-office order or by express. Either method is safe and can be sent at our risk.

Every set waranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue, which contains hundreds of recommendations for the Phil. Sheridan Instruments.

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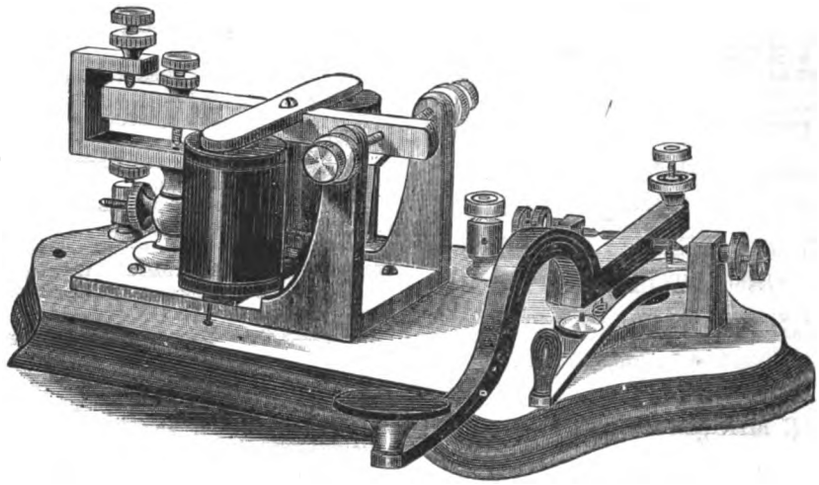
SUCCESSORS TO
A. B. LYMAN & CO.,
55 FRANKFORT ST., Cleveland, Ohio.

CO-OPERATIVE MANUFACTURING COMPANY,

218 Pear Street, Philadelphia, Pa.

GREAT REDUCTION IN PRICES.

CASH: FIVE DOLLARS, Complete.



CASH: FIVE DOLLARS, Complete.

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The above cut represents our "Improved" Learners' Instrument, which comprises a full sized Sounder and Key and is without exception the cheapest and best Learners' Instrument yet offered, there being nothing trappy about it.

It is mounted on a solid walnut Base, well seasoned, and gives a loud, distinct, clear sound.

This instrument is designed for schools of instruction in telegraphy, private telegraph lines and local circuits of telegraph companies, but more especially for students at home, office or counting room practice.

It can be made to work from a few feet to a circuit of twenty miles by winding the magnets with finer wire, making cost of instrument one dollar extra. These instruments can be mounted as represented "all on one base," or separate if desired.

OUR TERMS:

For Cash accompanying the order, this Instrument complete..... $5.00
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When sent C. O. D., Instrument complete..... 6.25
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Special terms to parties requiring several outfits. Remit by P. O. Order or Registered Letter, by which you save return charges and get the full benefit of the reduction on instrument.

SEND FOR PRICE LIST.

218 Pear Street, Philadelphia, Pa. W. R. BALDWIN, Manager.

ELECTRIC PEN AND DUPLICATING PRESS.

SIMPLE IN OPERATION,
PERFECT IN WORK,
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2,000 *of these instruments are in use among Railroad and Telegraph Companies and prominent Business Firms.*

Send for samples of work and description.

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GENERAL MANAGER,
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E. T. GILLILAND, General Eastern Agent,
20 New Church street, New York.

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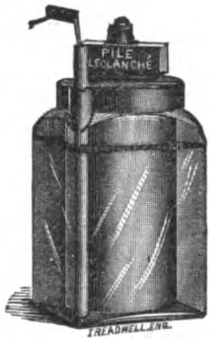
Responsible and Energetic Agents wanted to introduce the Apparatus.

THE LECLANCHE BATTERY.
(PATENTED.)



This is the ONLY one which is perfectly suitable for all open circuit work such as Electric Bell ringing, hotel and house annunciators, burglar alarms, signals, laboratory experiments, etc., or wherever a battery is wanted which is clean, free from acids, always ready for use, and does not consume when not in operation.

IT LASTS WITHOUT RENEWAL from SIX MONTHS to SEVERAL YEARS, according to use.

IT DOES NOT FREEZE, EMITS NO ODOR WHATEVER, and DOES NOT GET OUT OF ORDER.

For these reasons it is the only suitable and safe battery for bells, etc., in private houses where the battery MUST BE CLEAN, RELIABLE, and always ready for use.

The electro-motive power of Grove being 100, this is 75, and Daniell's 50; or three cells of this battery are equal to four cells of the Daniells.

Liberal discount to the trade. For circulars, prices, etc., send to

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Telegraph Instruments,

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BATTERIES OF EVERY DESCRIPTION

For telegraph and electroplating purposes.

BEST ENGLISH AND AMERICAN TELEGRAPH WIRE, LINE TOOLS, INSULATORS, etc.,

DIALS AND PRINTING INSTRUMENTS

For private and municipal lines.

THE MAGAZINE BATTERY.

Excelling the Leclanche for all Open Circuit Work.

POCKET INSTRUMENT FOR MEASUREMENTS.

We are now constructing instruments for measurement of currents that can be carried conveniently and safely anywhere.

The instrument is the differential galvanometer, measuring accurately by tenths of ohms up to 512 ohms. The battery can be charged and discharged in a few moments, and the entire set occupies less than one-tenth of a cubic foot.

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A LINE OF CHEAP MORSE APPARATUS.

SOUNDERS.....$3 00
W. U. KEY, Snapping Connections..... 2 50
NEW STYLE OF REGISTER (the European) RELAYS, BELL MAGNETS, and every description of Telegraph Goods,
SINGLE STROKE CALL BELL..... 2 50

HOTEL ANNUNCIATORS.

CHESTER'S PATENT

NON-INTERFERENCE STREET SIGNAL BOX,

For Fire Alarm Telegraphs and

ELECTRO-MECHANICAL GONG STRIKERS,

For Railway Signals and Fire Alarm purposes.

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WILSON ELECTRIC GAS LIGHTING COMPANY.

CHESTER'S IMPROVED CAUTERIZING BATTERY.

For Physicians' Use.

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And Supplies of every description.

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AND

POLICE TELEGAPH,

GAMEWELL & Co., PROPRIETORS,

No. 62 BROADWAY, NEW YORK.

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General Agent and Superintendent.
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ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,
San Francisco, Cal., Special Agents for California, Oregon, and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

AUTOMATIC PLAN,

is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM RELIABILITY;

Albany, N. Y.	New Orleans, La.
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Boston, Mass.	Newark, N. J.
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Cincinnati, Ohio.	Portland, Me.
Columbus, Ohio.	Peoria, Ill.
Cambridge, Mass.	Providence, R. I.
Charlestown, Mass,	Quebec, L. C.
Covington, Ky.	Rochester, N. Y.
Detroit, Mich.	Richmond, Va.
Dayton, Ohio.	Indianapolis, Ind.
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Louisville, Ky.	Syracuse, N. Y,
Lawrence, Mass.	Troy, N. Y.
Mobile, Ala.	Toledo, O.
Montreal, Canada.	Toronto, Canada.
Milwaukee, Wis.	Washington, D. C.
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The distinctive features of these systems of

FIRE ALARM AND POLICE TELEGRAPHS.

ARE

First—The AUTOMATIC SIGNAL BOXES, the simple electro-mechanism of which enables anyone—even a child—to give an *instantaneous, general* and *definite* alarm of fire.

Second—The AUTOMATIC REPEATER, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without constant personal attention of either operators or watchman.

Third—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

Fourth—The ELECTRO-MECHANICAL GONG STRIKER, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

These features combined form the

ONLY PERFECT, COMPLETE AND RELIABLE SYSTEM

OF

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Messrs. GAMEWELL & CO. are the owners of the original *FARMER AND CHANNING PATENTS*, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or efforts to secure improvements, and the systems are now covered by

MORE THAN TWENTY PATENTS.

The introduction and operation of the

AUTOMATIC SYSTEM

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

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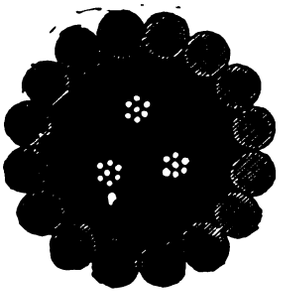
422, 424 & 426 East 25th St., N. Y.



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ONLY AMERICAN MANUFACTURER

OF

PURE GUTTA PERCHA GOODS.

IN THE

UNITED STATES.

Have on hand and make to order

SUBMARINE TELEGRAPH CABLES,

INSULATED WIRES, for

TELEGRAH AND ELECTRIC USE, and for

BLASTING AND MINING PURPOSES,

in every variety desired.

As an Insulation for Telegraph Cables and Electric Conductors GUTTA PERCHA has been universally adopted by all scientific and practical Electricians and Manufacturers of Telegraph Cables and wires in this country and Europe, and has sustained, with increasing confidence in the superiority, the practical test of over twenty years' general use.

The Proprietor *would say to all parties desiring*

SUBMARINE TELEGRAPH CABLES,

that he will guarantee to make and deliver at his Factory any style of Cable, Insulated with Gutta Percha, as low as they can IMPORT *Cable of the same style and quality.*

ORDERS RECEIVED AT THE FACTORY.

Messrs. L. G. TILLOTSON & CO.,
8 Dey Street, New York,
54 South 4th Street, Philadelphia,
22 West 4th Street, Cincinnati,

have been appointed by me GENERAL AGENTS for the sale of any Telegraph Cable or Wire manufactured at the Works in New York, at Factory Prices, delivered, in New York.

JOHN THORNLEY, 503 Chestnut Street, Philadelphia, Pa.,

has been appointed Agent for the sale of any and all goods manufactured by me, at Factory Prices, delivered in New York.

Any goods of my manufacture (except Telegraph Goods), are for sale in New York, by

H. G. NORTON & Co., 26 Park Place.
RUBBER CLOTHING Co., 363 Broadway.
D. HODGMAN, 27 Maiden Lane.
SHEPARD & DUDLEY, 150 William Street.

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S. BISHOP,

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SMITH & VANDEN HOUTEN, Printers, 181 William St.

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JOURNAL OF THE TELEGRAPH.

VOL. X., NO. 8. NEW YORK, APRIL 16, 1877. WHOLE NO. 227.

Original Articles.

THE NEW WESTERN UNION OFFICE AT PHILADELPHIA, PA.

About two years since the necessity of providing more appropriate accommodations and additional room for the large and rapidly increasing business of the Western Union Telegraph Company at Philadelphia became so urgent, that arrangements for that purpose were initiated and pressed forward as vigorously as possible. The desire and expectation was to have everything settled and in good working order at the opening of the Centennial year, which was to witness such an enormous influx of visitors.

The first step taken was to lease ample space in the magnificent new building of the Mutual Life Insurance Company of New York, at the northeast corner of Chestnut and Tenth streets. The premises to be occupied were fitted up in handsome style, and the apparatus to be used was all put in new, and much of it specially manufactured for the purpose. It was designed to make the Philadelphia main office a model office, and its occupancy was looked forward to with pride and pleasurable anticipations by all concerned. While these preparations were being made, poles were being put up for an entire new line through the city, on which all the wires were to be carried to the new office. There was no objection made or anticipated until after these poles had been erected, and were ready to receive the wires. Then it was suddenly discovered by certain parties that the poles were very objectionable, and an injunction against using them, until the permission of the City Council could be had was obtained. There the matter has rested until this spring, when the legal difficulties and obstacles interposed having been removed, the Company was allowed to go on and complete its work, and Philadelphia to have a telegraph office worthy of the city, and creditable to the foresight and enterprise of the Western Union Telegraph Company.

The new office was occupied for business for the first time on the 8th inst., on which day the headquarters of the Company were transferred, the wires connected, and the employés removed from the dingy and dilapidated quarters which had been so long and latterly unwillingly occupied, to the handsome and spacious accommodations which have been provided for their future occupancy. It is needless to say that they are all highly delighted with the change.

The new location is the most central for business purposes in the city, it being between the new Post-office and municipal buildings, both in process of erection, and in the neighborhood of the largest banks, hotels, and mercantile houses. The building is a very large and handsome one, and makes an imposing appearance from the street. The arrangements for lighting and ventilation are as perfect as they could be made. The edifice consists of a spacious cellar, high basement, three stories and a lofty mansard roof, and has a frontage of 58 feet on Chestnut street and 165 feet on Tenth street. The exterior of the building is a light, handsomely cut granite, and presents an appearance of solidity and excellence, enhanced by the evident superiority of material and workmanship. The building is constructed entirely of stone and iron, and is thoroughly fireproof throughout.

Lack of space will prevent a more detailed description of the building itself, and we will proceed to introduce the reader to that portion of it occupied for telegraphic purposes, in which he will be more especially interested. The basement and sub-cellar, a large room on the third floor, and the upper floor or mansard roof of the structure have been leased by the Company, and it is thought that sufficient space has been secured to accommodate the increase of the business for years to come.

The Receiving Office is in the basement, and is entered by wide and handsome doors from Chestnut and Tenth streets. The room is fitted up with walnut and presents a neat and elegant appearance. The partition which separates the employés from the public, is of walnut surmounted by figured glass panels. Around the whole of this there is a projection or shelf, which serves as a desk, which customers use for writing messages, etc. Within the space behind this partition are located the Receiving, Money Transfer, and Delivery Departments, each of which has been assigned ample space for the transaction of its business. In the rear of the Receiving Office is the waiting room of the messenger boys, with a private entrance thereto on Tenth street.

The Receiving Office connects by five pneumatic tubes, one from the cashier's desk, two from the general receiving office, one from the delivery department, and one from the money transfer department, with the operating room. Messages and communications are by this means instantaneously transmitted and any delay avoided. Speaking tubes also connect the different departments.

Ascending from the Receiving Office we next come to the office of the Supt. of the District, Mr. James Merrihew, under whose supervision and direction all the changes in the lines and offices in Philadelphia have been made. His office occupies the large front room which has been leased on this floor, and is, by an ingenious arrangement of closets serving as a partition, divided into two apartments. The rear room is occupied by Mr. Merrihew's clerks, and the front room is his private office. These offices are plainly but comfortably and substantially fitted up.

Above the third floor we come to the Mansard roof, which is really the fourth floor of the building. On the Chestnut street front of this floor is located the operating room, which to telegraphers will possess more interest than the other departments. The operating room has a lofty ceiling, is 50 by 58 feet, fronting on Chestnut and Tenth streets. This room has been elegantly fitted up and provided with everything requisite for the convenient despatch of business. The ventilation is all that could be desired. The air is delightfully pure, and it must be much more healthy for those employed than the old office with its low ceilings and close atmosphere. It is warmed by steam from ten radiators, and the vitiated and impure air is constantly and rapidly removed by several large exhaust shafts. Several of these shafts of ample dimensions extend through and ventilate the whole building.

The operating room has been fitted up with new tables made expressly for it. These comprise five divided into four compartments, four into six, six into eight, and two three-compartment tables, especially for repeaters. These tables not only provide for the lines already in operation, but for additions which will be made from time to time. There are now in use in this office 2 sets of quadruplex, 3 sets of duplex, 2 of Phelps' Motor Printers, which are to be quadruplexed, 57 sets of Morse instruments, and 6 sets of repeaters. There is also used for copying messages a motor press, also invented and manufactured for the company by Mr. G. M. Phelps.

A very large and handsome new switch, manufactured at the shop of the Western Union Company in New York, is placed at the right of the room. This switch is made in four sections, each of which will accommodate forty-four wires. The connections are nickle-plated, and the general appearance is highly creditable.

There are 41 operators employed in the office. Mr. Heber C. Robinson is the Manager, assisted by Mr. Geo. W. Porter, as assistant manager; Mr. John E. Zueblin as night manager, and Messrs. F. W. Davis and Geo. Merrihew as chief operators. Above the operating room in the tower, which is reached by a spiral staircase, are kept all the locals used. In the rear of the operating room is an ante-room, in which a number of wardrobes have been built, one of which is arranged for the exclusive use of two day men and one night man, each having a key.

In the rear of this ante-room is the bookkeepers' and clerks' department, which is fitted up with desks, tables, shelves, etc., and every convenience required to facilitate their business. Over this, reached by spiral stairs, is an apartment for storing the originals of messages, etc., which are required to be kept for a time.

Ascending to the roof, all the wires centering at this office are brought up from the poles and housetops on to iron frames, upon which the insulators are arranged. This forms a perfect net-work, but all are systematically arranged and properly insulated. There are now run upon these frames 75 wires from the south, 72 from the east, and 78 from the north. These are all carried into the tower, and each is connected with a lightning arrester, and from these are carried down to the switch-board in the operating room upon cables.

In addition to the Western Union Wires, the wires

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wheel o o' and it prevents the prickers from touching the edges of the hole either in rising or in falling; the paper is, therefore, quite undamaged by its passage through the instrument and the same strip may be passed through any number of times. By means of a centrifugal friction governor, the speed may be readily adjusted whilst the machine is running.

It is interesting to observe in this as well as in several other parts of the machine the practical application of true kinematical principles of freedom and constraint—a feature of design which is one of the most prominent characteristics of all Sir William Thomson's instruments. By aid of a "geometrical clamp" the vulcanite plate W which carries the various contact springs can be removed for clearing and fixed again exactly in the right place by a single screw H.

The punchers by which the paper is prepared are of various forms. They are conspicuous for the exactness of the spacing which they give, no matter what the speed of the punching may be. In one of them (Professor Jenkin's Power Puncher) the heavy part of the work is done by energy stored in a wound-up spring or raised weight, and all that the operator does is to touch light finger-keys, which cause this energy to take effect. For a full description of the details both of the Automatic Sender itself and of the punchers, the reader is referred to a paper in the *Journal of the Society of Telegraph Engineers*, vol. v., 1877.

Where the limit of the speed of signal lies, not in the skill of the operator, but in the conditions of resistance and capacity of the line, as is the case in all long submarine cables, the Automatic Curb-Sender gives a great gain in speed. Experiments made with the imitation Atlantic cable in the Laboratory of Glasgow University shows this gain to be at least as great as fifty per cent. To the practical telegrapher this is only one out of many advantages which the "auto-curb" has over the hand-key. It is now widely admitted that the automatic working of telegraphs generally is not only less directly liable to mistakes than working by hand is, but has also an indirect effect in preventing mistakes by making them more easily traceable when they do occur.

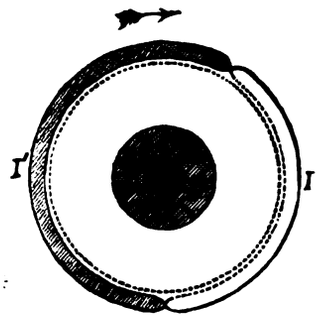

Fig. 4.

The benefits of automatism, already so fully appreciated in the working of land systems, have now been extended to cables; and this extension is certainly not the least of the many services which Sir William Thomson and Professor Fleeming Jenkins have done for submarine telegraphy.—*The Telegraphic Journal.*

Electrical Conduction.

BY PROF. R. C. KEDZIE.

In the Farmers' Institutes of last winter I spoke of lightning rods, their forms and construction, and endeavored to tell farmers how they could put up their own rods with a very large saving of expense. I stated that the highly artificial forms so generally in use, such as fluted rods, wire ropes, flat strips, etc., were not essential features of a good rod, and that of increase of conducting power. On this last statement a warm discussion arose, and Professor Henry, Secretary of the Smithsonian Institution,

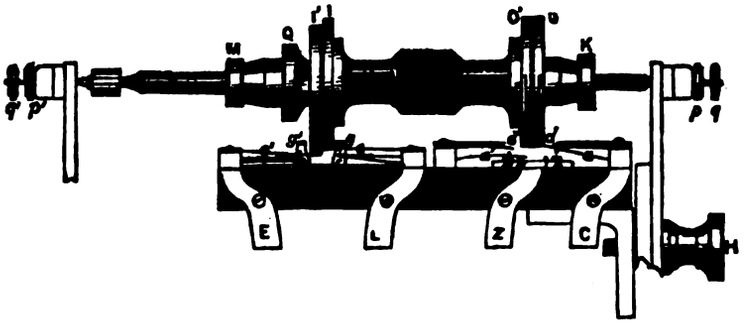

Fig. 2.

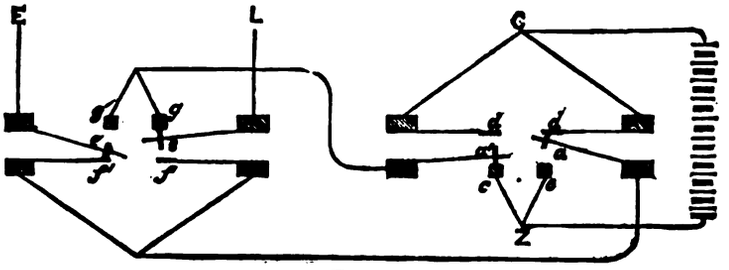

Fig. 3.

was quoted as authority for the doctrine of conduction of electricity of high tension at the surface. Out of this came the correspondence and investigation which I now present to you, beginning with the letters of Professor Henry, which he has kindly permitted me to use.

Prof. Henry's letters, with his final corrections, are as follows:

SMITHSONIAN INSTITUTE,
Washington, March, 11, 1876.

DEAR SIR:—In answer to your letter of the 7th inst., I have to say that the discrepancy which exists as to the question whether electricity passes at the surface or through the whole capacity of the rod has arisen principally from experiments on galvanic electricity, which having little or no repulsive energy, passes through the whole substance of the rod, and also from experiments in which a very large quantity of frictional electricity is transmitted through a small wire; in this case the metal is resolved into its elements and reduced to an impalpable powder.

In the case, however, of the transmission of atmospheric electricity through a rod of sufficient size to transmit the discharge freely, there can be no doubt that it tends to pass at the surface, the thickness of the stratum of electricity varying with the diameter of the rod and the amount and intensity of the charge.

To test this by actual experiment I made the following arrangement: through a gun-barrel about two feet in length a copper wire was passed, the ends projecting. The middle of the wire in the barrel was coiled into the form of a magnetizing spiral, and the ends of the gun-barrel were closed with plugs of tin-foil, so as to make a perfect metalic connection between the wire and the barrel. On the outside of the barrel another magnetising spiral was placed, the whole arrangement being shown in the annexed sketch.

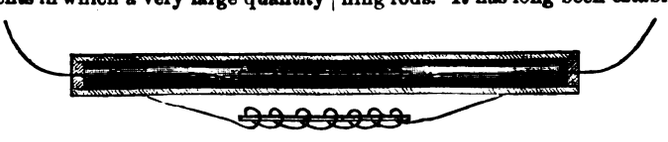

Fig. 1.

A powerful charge was now sent through the copper wire from a Leyden jar of about two gallons capacity. The needle within the barrel showed not the least sign of magnetism, while the one on the outside was strongly magnetic.

From this experiment, I conclude that a gas-pipe can convey an ordinary charge of electricity from the clouds as well as a solid rod of the same diameter.

The repulsive energy of the electrical discharge at right angles to the axis remains of the same intensity as in the case of a statical charge. This I have shown to be the case by drawing sparks of considerable intensity from a conductor, one end of which was connected with the ground while sparks were thrown on the other end from a large prime conductor. This spark is of a peculiar character, for though it gives a pungent shock and sets fire to combustible substances, such as an electrical pistol, it does not effect a sensitive gold leaf electrometer. The fact is, it consists of two sparks, the one negative and the other positive. The rod during the transmission of the electricity through it is charged + at the upper end and immediately in advance of this point it is charged — by induction, and the electricity passes through it in the discharge in the form of a series of + and — waves.

Yours very truly,

PROF. R. C. KEDZIE, Lansing, Michigan. JOSEPH HENRY, *Sec. Smithsonian Inst.*

SMITHSONIAN INLTITUTION,
Washington, D. C., April 15, 1876.

R. C. Kedzie, Lansing, Mich.:

DEAR SIR:—Your letter was received by due course of mail, but a press of business connected with the preparation of the annual report for 1875 and the lighthouse board has prevented an earlier reply.

I have now to say that as far as I know I am the only person who has made a special study of the conduction of frictional electricity in regard to lightning rods. It has long been established by Coulomb and others that the electricity of a charged conductor exists in a thin stratum at the surface, and this is a necessary consequence of the repulsion of electricity for itself, every particle being repelled from every other as far as possible. From this it was hastily assumed that electricity in motion also moves at the surface; but this was an inference without physical proof until I commenced the investigation. I found from a series of experiments that *frictional* electricity, that is, electricity of repulsive energy, such as that from the clouds, does pass at the surface, but that

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galvanic electricity, the kind to which Faraday, Daniells, De La Rive and others refer, passes through the whole capacity of the conductor. This latter fact, however, was previously established by others. I further found that whenever a charge of electricity was thrown on a rod explosively, however well connected the rod was with the earth, it gave off sparks in the course of its length sufficient to fire an electric pistol and light flocculent substances. I also found that in sending a powerful discharge from a battery of nine (9) jars through a wide plate that no electricity passed along the middle of the plate, but that it was accumulated in its passage at the edges.

From all my study of this subject I do not hesitate to say that the plan I have given of lightning rods is the true one, and that a tube of a sufficient degree of thickness serves to conduct the electricity as well as a solid mass, provided the thickness is sufficient to give free conduction. A very heavy charge sent through a wire frequently deflagrates it, but no discharge from the clouds, of which I have any knowledge, has ever sufficed to deflagrate a gas-pipe of an inch in diameter.

The plan of increasing the surface of a rod by converting the metal into a ribbon is objectionable. It tends to increase the power of the lateral discharge, and gives no increase of conducting power.

Another fallacy is much insisted on, viz.: the better conduction of copper than iron. It is true that copper is a better conductor of *galvanic* electricity, which pervades the whole mass, but in regard to *frictional* electricity the difference in conducting capacity is too small to be of any importance.

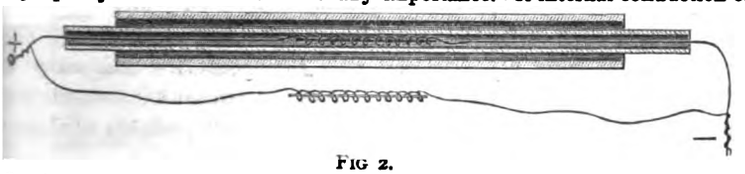

FIG 2.

Iron is sufficiently good in regard to conduction, and withstands deflagration better than copper; besides this, it is much cheaper.

Yours truly,

JOSEPH HENRY.

Whenever I read these letters of Prof. Henry I am struck with the great kindness of a man so eminent in science, who, amid so many and such weighty cares and responsibilities, will yet take the time to write such letters to one so little known as myself. They afford a striking illustration of the ennobling influence of science upon her votaries.

I am painfully conscious of the rashness of one in my position attempting to refute or even question a scientific proposition advanced by Prof. Henry, but especially on a question to which he has devoted so much time in original research and experimental investigation. But here is a question in science regarding the path of conduction of electricity of high tension through a metalic rod. On one side we have the statement of Prof. Henry claiming that he is the only man who has given special attention to the path of conduction of electricity of high tension, who states that conduction of this form of electricity is *at the surface* of a conductor; on the other side we have the statement of men distinguished in science who affirm that this, like other forms of electricity, is conducted *through the mass* of the conductor, and is not confined to the surface, as in the statical condition.* The question thus arises, what is the path of conduction in electricity of high tension?

Some may ask, what does it matter whether conduction is at the surface or through the mass of a conductor? Why not rest satisfied with the fact that a metallic rod will conduct electricity without questioning closely the path of conduction? To these questions I offer two answers: 1st, the forces of nature will still act whether we recognize them or not; they do not suspend their action because of our ignorance; gravitation did not wait for Newton to discover its laws before it exerted its marvelous pull, which may hold a world in its safe path or overwhelm the luckless traveler with the thundering avalanche. 2d, the use of a scientific fact may outcrop long after the fact was discovered. The principle announced by Christ, "the truth shall make you free." holds in science as well as in morals. To know and obey all of nature's laws is the only path of safety; to know that we may obey is the supreme satisfaction of the human soul.

In entering upon this investigation I found in the text books only the results, and not the processes by which such results had been reached. As I had no access to the original papers, I was thus thrown upon my own resources for such investigation. Fortunately I had in Prof. Henry's letters an outline of the investigations, by which he had reached his results. I therefore took them as the starting point in my investigations and made them the basis of this essay.

The experiment of Prof. Henry with a magnetizing spiral inside a gun-barrel is a very striking one, and at first sight it seems conclusive against the doctrine of internal conduction of electricity of high tenison. I repeated his experiment and found the needle in the internal magnetizing spiral only very feebly magnetic, while the needle in the external spiral was strongly magnetic. Can these results be explained in any way except by the assumption of surface or exterior conduction? Two objects presented themselves to the inference of exterior conduction from this experiment: 1st. The gun-barrel has a large amount of conducting material compared with that of the contained wire. The experiment was varied by substituting a large glass tube coated with tin-foil in the place of the gun-barrel, so as to make the amount of conducting material, external and internal, more nearly equal; on passing a strong charge of frictional electricity through this combination, the needle in the internal spiral was *strongly magnetic*. The experiment was again varied as follows: a piece of inch gas-pipe 26 inches long was substituted for the gun-barrel; in this a stout piece of copper wire (one-sixth inch in diameter), was inserted, the wire being coiled into a magnetizing spiral, and a steel needle being placed in the axis of the spiral; on passing a charge from a battery of ten two-quart Leyden jars, the needle in the internal spiral became magnetic, but less strongly than that in the spiral in the glass tube coated with tin foil.

This raised the question whether the electricity which passes by the internal wire expended the whole of its magnetizing influence upon the needle within the spiral, or was a portion expended upon the surrounding iron tube, whether gas-pipe or gun barrel? This question was submitted to experiment as follows: Two spirals having the same number of coils were formed from the same piece of wire; in the axis of these spirals two needles as nearly alike as possible were placed; one of these spirals was placed in a long glass tube (to insure more perfect insulation), and this tube was placed inside a gas-pipe; the other spiral was outside the gas-pipe and a few inches from it; two ends of the wire were then made clean and bright, twisted together and capped with a brass ball; the other two ends were also made clean and bright, twisted together, and connected with the outside coating of the battery of Leyden jars.

Fig. 2. exhibits this arrangement.

Here two perfectly equal paths were open for the passage of electricity, and if a charge were passed from + to — the electricity would divide, and equal amounts pass by each conductor, and the needle in both spirals would exhibit the same amount of magnetic intensity unless the iron tube exerts a modifying influence over the magnetizing power of the internal spiral. The experiment was tried repeatedly, and uniformly the needle in the internal spiral was inferior in magnetic intensity to the needle in the external spiral usually in the proportion of 2 to 5.

We thus see that the conditions attending Prof. Henry's experiment, instead of the simplicity which they at first sight seemed to have, were in fact quite complex. The intensity of magnetism developed in the needle in the interior spiral cannot be accepted as a true measure of the amount of electricity which passed through the interior wire.

[*To be concluded in next number.*]

*Conduction.—In all cases where electricity is in motion, whether it be excited by chemical action, as in the voltaic pile, or by friction, as in the common electrical machine, the force is conveyed by the entire thickness of the conductor; the charge is not confined to the surface, as occurs when the power is stationary, and produces effects by induction only. In the case of the voltaic current as well as in the momentary discharge of the Leyden battery, by far the greater proportion of the induction occurs between one transverse section of the conductor and the adjacent sections immediately before and behind it; and but a small proportion of the induction, sufficient however to be distinctly manifest, is diverted to surrounding objects.—*Miller's Chemical Physics, pp. 404-5.*

Telegraph Wires Melted by Lightning.

A VERY severe thunder-storm passed over London on the evening of July 5. Between eight and nine there came a very brilliant flash of lightning, followed by a deafening peal of thunder. Many people were stunned, and in several cases were found quite insensible. Immediately after it was found at Kilburn that the telegraph wires, running from the top of the Queen's Arms to a house about 300 yards higher up the Edgeware Road, were struck by the lightning, and fell in red-hot fragments, varying in length from six inches to an inch, all along the road, a great deal of yellow smoke attending the fall of the wire. This shows that ordinary telegraph wires are not probably large enough to carry heavy strokes of lightning with safety.

Muscular Contraction and Electricity.

MUSCULAR contraction is always accompanied with Electrical phenomena. The difference of electric force between two points of a muscle undergoes a diminution, which, according to Bernstein, precedes the contraction by one-one hundredth of a second. M. de la Roche has recently examined the electrical power of the human heart. The electrodes consisted each of a plate of amalgamated zinc with a pledget of muslin saturated with sulphate of zinc at the lower extremities. These were applied, one with its muslin wad opposite the heart on the left breast, the other on another part of the chest, and connection was made with a capillar electromoter. The mercury column executed a very distinct series of periodic pulsations, synchronic with the pulse. Each pulsation marked the double movement of the heart. The result obtained, corresponded to one-one thousandth of a Daniell element.

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Published Semi-monthly at 195 Broadway.

J. N. ASHLEY, EDITOR.

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NEW YORK, SEPTEMBER 1, 1877.

To District Superintendents.

The attention of District Superintendents is called to the following extract from Executive Order No. 169, in regard to the use of the new requisition form No. 6, a.

"Upon receipt of such requisitions, the District Superintendent will carefully examine each item, *and strike out*, in each of the three copies, *such as are unnecessary*. If there are any items which are proper, but require curtailment, *he will strike out the original figures and enter opposite thereto, in the column headed 'As Revised,' the amounts allowed by him.*"

In many of the requisitions upon the new form, the above requirements have not been complied with. For example: Some Superintendents fill out the column headed "As Revised," whether the original figures are changed or not. Others do not strike out the original figures when curtailment is necessary, but simply enter the proper amount in the column headed "As Revised." Others again do not strike out the items which they consider unnecessary, but indicate their disapproval by a dash opposite the item, in the column headed "As Revised."

Much trouble has been occasioned by these improper methods, and a strict compliance with instructions is urged.

Dangers of Submarine Telegraphs.

The peculiar difficulties to which the maintainance of Submarine Telegraphs is subjected are well known. From an item of news recently received from the coast of South America, it seems to these must now be added that of earthquakes. The cable from Callao, south, had been broken it was supposed by earthquakes, which had taken place and which had done much other damage.

This is a contingency which it will be difficult to guard against, but one which fortunately will not be likely to be of very frequent occurrence.

UNION OF TELEGRAPHIC INTERESTS.

The rivalry which has existed between the Atlantic and Pacific and Western Union Telegraph Companies for several years past, and which has been especially active during the last six months, has come to an end by an arrangement for future co-operation, which went into effect on the 21st of August.

By the terms of that arrangement, the two companies will continue their separate organizations as heretofore, and each will continue to maintain and operate its own lines and offices, yet the gross telegraphic receipts of both will go into a common fund, and be divided 12½ per cent. to the Atlantic and Pacific and 87½ per cent. to the Western Union Company. The net receipts of each company, after paying current expenses and other liabilities, will be available for dividends to the stockholders.

After the above arrangement was concluded the Western Union Company purchased the majority of the capital stock outstanding of the Atlantic and Pacific Company.

The advantages of this combination of interests to the stockholders of both companies will be readily apparent, nor will it deprive the public of any telegraphic facilities which they have heretofore enjoyed. The closing up of some offices which have been established not to meet any public demand, but for the sole purpose of enabling one company to draw business from the other, and connecting the wires of both companies with all the principal offices of both, will enable the wires of both to be practically worked as one system, whereby the transmission of messages will certainly be facilitated in some degree.

The tariff of charges must necessarily be re-arranged, and while some rates will be advanced in the heretofore competing territory, a larger number will be reduced, and the reduction will be greater in many cases than the advance in any.

There being no longer any motive on the part of the agents of either company to draw business away from the other, it is to be hoped that the only rivalry exhibited hereafter will be to see which can serve the public best, and that the employés of both Companies will strive as earnestly hereafter to promote the common interests as they have heretofore to advance that of the companies with which they have been respectively connected.

Equalizing Tariff Rates.

For several months past, three classes of rates for substantially the same distances have been in force throughout the territory occupied by competing lines.

1. Rates between competing stations which, with few exceptions, have been 25 cents, without regard to distances.

2. Rates between competing and non-competing stations, which have ranged from 25 cents to $1; and

3. Rates between non-competing stations in the same territory, from 25 cents to $2.

One of the first necessities of the arrangement for co-operation between the Telegraph Companies the equalization of these rates. To do this ev approximately, without too great an increase in so rates, or too great a reduction in others, it will readily seen is a work of much difficulty. T officers of the two Companies have, however, agre upon the general outlines of a plan of equalizati which will be carried out as fast as the details can perfected.

The first step is the extension of the 25 cent r in the territory east of the Mississippi River, fr 25 miles, as heretofore, to a minimum of 100 mi in an air line from each station. This will red the rates between a large number of stations, 5, and 15 cents. The next step fixes $1 as the ma mum rate between all stations east of the Mississip and Missouri Rivers.

By this change a number of rates between statio in Iowa and Missouri, and those in New Engla and the Atlantic coast, will be reduced $1, and al a considerable number of rates between stations the Southern, and several of the Northern a Eastern States will be reduced 25 and 50 cents.

The rate from New York, Philadelphia and Bal more, and intermediate stations to Cincinnati a Chicago, will be 40 cents; to Louisville, St. Lou and Milwaukee, 50 cents.

The rates between New York and Washingto Albany and Boston will remain at 25 cents.

The local rates throughout New England and th State of New York will remain substantially as present, except that a few will probably be advanc 5 cents, while a larger number will be reduced fro 30 to 25 cents.

These changes can hardly fail to give gene satisfaction to the public. They indicate a disp sition on the part of those charged with the manag ment of the Companies to continue the policy ina gurated by the Western Union ten years ago to gi the public lower rates as fast as the increase of bu ness and of the facilities required for handling promptly would enable them to do so without doi injustice to the owners of the property.

Although these changes still leave the rat throughout a portion of the Northern and Easte cities somewhat lower than for corresponding di tances in the Southern and in a portion of th Western States, yet it is to be remembered that th section of country where the low rates prevail offe the largest volume of business and yields much th largest portion of revenue.

In this connection, the following extract fro President Orton's semi-annual report, submitted i December, 1874, seems pertinent:

"Such is my confidence in the growth of th telegraph business within the next few years, that I believe it will be practicable for the Company t continue reducing the higher rates, and extending the distances to which the lower rates are applied, until we shall ultimately have but four rates for da messages, namely: 25 cents, 50 cents, 75 cents and $1, and half these rates (excepting the lowest) fo night messages, and that this result can be gradual

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mplished without impairing the Company's ity to pay satisfactory dividends to the stock lders."

Electrical Conduction.

HE article on Electrical Conduction by Professor dzie, which is commenced in this number of the RNAL OF THE TELEGRAPH, and which will be com- ted in the next number, will be found of interest. f. Kedzie discusses the question with ability, think very satisfactorily demonstrates that Henry is in error in the conclusion that the duction of electricity of high tension is at the face, instead of through the mass of the con- uctor.

he Quadruplex on British Telegraph Lines.

MESSRS. PREECE AND FISCHER, upon their recent of- ial visit to inspect the operation of the telegraphs this country were so favorably impressed with the uadruplex system, in extensive and successful use pon the lines of the Western Union Telegraph ompany, that they desired to have it tested on the ritish Government telegraph lines. Permission aving been obtained for such test from the Post- ffice authorities, Messrs. Gerritt Smith and George A. Hamilton, of the electricians' department of the ompany, will sail in the Cunard Steamship Algeria, rom New York, on Wednesday next, the 5th inst., to et up and exhibit the apparatus in practical opera- ion on the English lines. They will take with them full sets of the apparatus for that purpose.

We commend these gentlemen and their mission to the kindly consideration of their English brethren, and have no doubt they will receive a cordial wel- come.

Swindling Schemes.

WE are continually in receipt of copies of circulars forwarded to telegraphic employés all over the country by swindlers who make their headquarters in this city, which propose to secure fortunes to those who are favored with them. To make sure of this good luck a preliminary investment of from one to ten dollars is of course required. A pretend- ed firm of "Bankers, Commission, Stock and Gold Brokers" in new York, have apparently flooded the telegraph offices outside the city with circulars ex- planatory of a combination for operating in stocks in which investments can be made from one dollar up- wards, with an assurance of enormous profits. From an inquiry into the business of this concern we learn that it consists almost exclusively in mailing these circulars and receiving the money of their patrons.

We have been repeatedly requested to expose these "schemes" by the victims. Persons with an ordin- ary share of common sense, should know without being told that they are unmitigated swindles, and that the more cash they invest in them, by just so much will their finances be depleted. Reputable houses engaged in legitimate business could not be induced to lend their names to such operations, and those who expect to be dealt with honestly, and to realize a profit from investments with parties en- gaged in such nefarious enterprises, only exemplify anew the truth of the old adage that "a fool and his money are soon parted."

Spiritual Telegraphing.

OUR Texas correspondent, who in another column details his experience in mental or spiritual tele- graphic communication, established by means of a doorkey and a coin, presumably a nickel, appears to have opened up a new development of telegraphic possibilities. So far he does not seem to have ac- complished much, but, like all new discoveries, it requires to be worked up, and there is no telling what important results may be obtained. His dis- covery has certainly one recommendation, it is inex- pensive and available to everybody, as it will scarcely be possible to patent it.

His telegraphic familiar seems to be rather of the prohpetic order, as becomes a higher intelligence, but perhaps may be brought down to every day work under more skillful manipulation. The tele- phone is nowhere alongside of this latest discovery, for it puts us in direct communication with intelli- gences which would find even the telephone too gross to be vibrated in response to its manipulations.

We shall endeavor to await calmly and patiently the further developement of this great discovery. In the mean time the world must be satisfied to avail itself of existing methods of telegraphic communica- tion, with such improvements as inventors of more material appliances can suggest.

From the *Telegraphic Journal.*

Electricity and the Electric Telegraph. By GEORGE B. PRES- COTT. (New York: D. Appleton & Co.; London: E. & F. N. Spon, Charing Cross.)

SINCE the days when the electric telegraph was fairly established, the amount of literature which has appeared bearing on that subject, and also upon electricity as especially applied to the working and maintenance of working of the electric telegraph, has been by no means scanty; yet the appearance from time to time of new works on the science which, as a rule, command a ready sale, shows that there is plenty yet to be written about electrici- ty and the electric telegraph.

The Americans, although they have ever been in the van as regards the practical working of the electric telegraph system, have by no means kept pace with their transatlantic brethren as regards the literature of the subject. We say have *hitherto* not kept pace, but the production of the work before us has gone far to wipe out this reproach, if it has not completely done so.

Mr. Prescott has produced a work of which the American telegraphists may well be proud, and which reflects the highest cerdit upon himself, both as regards the choice of matter which he has taken from foreign works and for the very excellent way in which he has put it together.

It is no reproach to a book that it is very largely composed of scissors and paste work so long as this is well put together, and the book before us, as in deed Mr. Prescott states in the preface, is very largely indebted to the writings of foreigners. We think, however, that Mr. Prescott would have done a graceful action if he had, in a few more cases than he has, stated to what writers he owes the informa- tion he has so largely made use of. We, in several places throughout the book, have noticed that arti- cles which have appeared in this journal have been copied verbatim into the work without any acknowl- edgement of the source from which the information was drawn being mentioned. We notice indeed, towards the end, an acknowledgement of the ex- tract of Mr. Kemp's articles on Resistances and their measurement from this journal, but at the earlier part we observe a full description of the Thom- son galvanometer, with plates, from the pen of the same gentleman, which also appeared in the pages of this journal, but for which no acknowledgement has been made, and also in one or two other cases we have found similar omissions. We do not think Mr. Prescott would have lost anything—rather the contrary—by such admissions of his indebtedness in his excellent work.

Being of an American origin, the book naturally deals largely with American systems of telegraphy, but such matter by no means forms the bulk of the volume. As it is written rather with the view to impart imformation of the state of the telegraph system as a whole, this is not to be wondered at.

The introductory chapters are of the kind common to books of this class, and deal with frictional elec- tricity, static induction, electrical machines, &c. The chapter on Batteries gives a very good descrip- tion of almost every kind of battery in use. The gravity battery, which is the almost universal form in America, is naturally very fully described. This element is met with in a great variety of forms; we notice the Menotti (*sic*) of course amongst the num- ber, and wonder whether authors will be ever agreed upon the way of spelling this word; we have certainly seen it spelled four ways, viz., Menotti, Minotti, Menotto, and Minotto; it would be interesting to know which is correct.

We notice, in describing the Leclanche battery, that Mr. Prescott speaks of the positive and negative poles of a battery as consisting of carbon and zinc plates, an expression which is hardly correct, and is misleading.

We are glad to see that the expression "intensity" of a current has not been made use of, but that "current strength," which is a term that cannot mislead, is used; indeed, throughout the work mis- leading terms, which are so often found in electri- cal works, seldom occur.

In the chapter on apparatus for electrical measure ment, a section on wire gauges is introduced, in which the lack of uniformity in those employed by different manufacturers and countries is drawn at- tention to. It would be a great advantage if one uni- form gauge could be adopted; but the conserva- tism which has prevented something practical being done in the matter still remains unyielding, and no move seems likely to be made in the matter, which is a source of inconvenience.

A great deal has been said about the arranging and advisability of working several lines from one battery. On this point, at the conclusion of a chap- ter in which the subject is very thoroughly dealt with, Mr. Prescott says; "It will be seen that the great waste of money in working many wires of all lengths out of one battery is not the most grievous loss; but that the injurious effects upon the practi- cal working of the wires, especially during wet weather, far outweighs it. Few persons, we appre- hend, really know how much of the trouble which arises from this great evil of working so many wires from one battery is erroneously attributed to bad in- sulation and other causes." These remarks, coming from one who is eminently qualified to judge upon the subject, are worthy of every consideration.

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From the chapter on insulators we learn that glass is the favorite material employed in America, though it does not appear altogether to be a satisfactory one. Mr. Prescott agrees that the best material is the white porcelain so much used on the Continent, and which, although more expensive, no doubt will eventually supersede both glass and brown earthenware.

Although we should have liked to have gone through the book and pointed out, chapter by chapter, its many excellencies and few defects, space forbids us to say more on the subjects of which the book deals in common with other works published on our own side of the Atlantic.

Turning to the chapters which deal more particularly with the American forms of instrument, we are struck by the neat and compact form in which the instruments are made, and by the lightness of the Morse keys, which seem to point to the rapidity and skill with which the American operator works.

We notice that the American Morse alphapet differs from that employed in Europe and its dependencies; but it is not found to cause any inconviences, in consequence, no doubt, of the isolated position of America from the rest of the world.

Speaking of the closed circuit system, which is in almost universal use in America, it is stated that as many as forty stations are placed on one circuit, a great contrast to the European practice, where even on the least busy circuits six instruments are considered quite a sufficient number.

Mr. Prescott's description of the repeaters, so extensively used in America, is very interesting and clear, and shows well the extent to which ingenuity can be exercised to obtain any particular end.

The duplex and the quadruplex systems naturally secure a very fair amount of attention, and here Mr. Prescott is quite at home, as several important improvements in the systems are due to his genius.

In the portions of the work where the theoretical matter is dealt with, such as is involved in the testing of lines, etc., Mr. Prescott has shown that he is by no means a novice, but is thoroughly competent to impart information on such subjects.

Here we must conclude, although the book well deserves to have its numerous points of usefulness brought prominently forward for the information of our readers, but space forbids more to be said, and we can only conclude by saying, that to the American telegraphists especially, the book must prove of extreme value and interest, and English telegraphists will by no means make a mistake if they add it to their libraries, We think Mr. Prescott has done good service to the telegraph profession in general, and to the American branch of it in particular, by the care and trouble which he must have exercised in bringing out his excellent work.

A Curious Use of the Magnet.

A curious utility of the magnet is mentioned in the Adelaide *Register* of June 14. A young lady sat down on a settee on which a needle had been carelessly left. It pierced her thigh, and totally disappeared in the flesh. Medical men said that it could only be reached by a large incision, and concluded to leave it for a time, in the hope that it might work itself out. The pain, however, became so severe that the young lady was confined to her bed. So a magnet was suggested, and a powerful one being procured and applied, in four hours the needle reached the surface, raised and prortuded itself through the skin, and was instantly extracted. It had been in the flesh for three weeks.

Correspondence.

ELECTRICAL TRANSMISSION THROUGH THE EARTH.

Chicago, Ill., *Aug.* 13.

To the Editor of the Journal of the Telegraph:

In the *Telegraphic Journal* has appeared an article on "Electrical transmissions through the ground" from notes of M. du Moncel to the Paris Academy. In the article referred to are many allusions to "oxidation" etc., also to "telluric currents" generated by two metallic plates of *different natures* buried in the ground.

The following is an account of a similar arrangement patented by Mr. S. J. M. Bear, of Mitchell, Iowa, the patent for which was allowed January 3, 1877, published in a Chicago paper in March, 1876.

"In the year 1859, on the 9th of August, there was granted by the United States a patent to Stanislas Hoga, William Peter Piggott, and Septimas Beardmore, of Middlesex County, England, for an "Improved mode of Generating and Applying Electric Currents in Telegraphing."

The "invention consists in transmitting the electric current directly through and by means of the Earth, or natural body of water, using the line wire only for the return current."

Claim—"The application to telegraphic instruments of currents of electricity, produced from metals or substances arranged in the earth, or natural bodies of water, in the manner and for the properties and relations described."

Three years prior to the date of the above patent an obscure individual in the interior of Illinois invented a method of "receiving" and "transmitting" electric currents for the purposes of telegraphing (through the earth) without a return or line wire. The important discovery was not patented, and yet remains to be brought into public use by some enterprising Yankee of an inquiring turn of mind, who may now be whittling at some valuable invention in front of an inland country grocery. Who knows?

I published in a newspaper in Peoria, Illinois, in the winter of 1857, a statement regarding discoveries similar to those claimed to have been made by M. du Moncel in his researches, with a prediction that the time would come when vessels in the ocean would communicate with each other telegraphically by electric currents passing through the earth or water.

I claim for one Henry Nelson, (now deceased) the important discovery mentioned in the above extract, Mr. Nelson was then living near Galesburg, Illinois, and was the inventor of an electro-motor engine exhibited at that time, of which I was a part owner, but subsequently disposed of my interest to another party. Scientific gentlemen, or pretended scientists, opposed Mr. Nelson's theory of telegraphing through the earth without wires, until he repented of having made the important discovery.

My object in stating these facts through the Journal of the Telegraph is merely to show that French or other foreign inventors are not always the original or sole inventors or discoverers of important inventions or principles. While giving foreigners full credit for all their progress in science, do not let us overlook or fail to show that American genius triumphs over all, and that to Americans and American inventors is the world indebted to-day for progress in science and practical attainments,

Henry C. Strong.

First Telegraphic Sound Reader.

New York, *Aug.* 20.

To the Editor of the Journal of the Telegraph.

Who was the first to receive telegraphic messages by sound, seems to be worthy of proof.

As early as 1845-6 and 7 nearly all operators could receive by sound the signal letters then in use; for example, I may mention the signal of an office. If that was an S. H or P, any one could count the dots and understand the signal. So it was with the abbreviations then used, such as "S S S," meaning the end, or "no more." S. F. D. "stop for dinner:" S. F. P. "stop for paper," and "O K" for all correct, all of these, and many more I understood by sound as early as 1845.

But the above are limited, and cannot be regarded as receiving by sound.

The man that is entitled to the honor of first receiving messages by sound as a business lies in a soldiers grave! It was Edward H. Barnes. Before any other man could receive one hundred words by sound, and by that alone, he was adjudged a violator of the Morse patent for receiving by sound without license, and sentenced to imprisonment and the payment of a heavy fine, and to lay in jail until the fine was paid. At my request, the court changed the penalty, to requiring a bond to do so no more. This was in October, 1848. In the autumn of 1847 Barnes received hundreds of messages by the click of the relay at Louisville before the registers were received from the east.

In September and October, 1848, Barnes received the market reports from the eastern cities every night until I had him arrested, and these reports, some times, reached a thousand words, including figures, fractions and cypher abbreviations; these can be found in the Louisville papers of that date, and the proceedings in the Federal Court of Kentucky, above referred to, can be seen at my office.

Tal. P. Shaffner,
78 & 80 Broadway.

New York, *Aug.* 27.

To the Editor of the Journal of the Telegraph.

I send you the following extract from the book I am now completing "The Telegraph in America," as my contribution to the inquiry "who was the first sound operator."

"Writing by sound was a prominent feature of the Morse patent and to which the alphabet was well adapted. There was a strong tendency to adopt it from the beginning, signals were always thus received. Professor Morse and Mr. Vail could readily translate by ear brief conversations when slowly manipulated. Mr. Vail readily acquired what facility he possessed of this character in the process of teaching the art and which for some time he prosecuted at Washington at $25 for each pupil. Indeed, from the time when the first click of the magnet was heard in forming letters, the power to speak thereby was apparent. It seemed, however, to require a higher class of intellect and a capacity for fine discrimination of sounds which was supposed to be not readily attainable. The companies deemed the process dangerous. It removed the evidence of transmission, and prevented the ready detection of the sources of error in which the officers of telegraph companies felt their safety largely to consist. By sound no such evidence was possible, and the correct sender had no defence against the incorrect receiver. To secure careful transmission, therefore, it was forbidden. Yet many of the early operators received messages by sound, while allowing the registering machines to run and the messages to be recorded in obedience to orders. Louis F. Zantzinger, a quick and intelligent operator in the Washington office in 1845, readily received in this way, but only as an occasional experiment. Soon after Mr. Vail opened the Philadelphia office in the close of 1845, and the public crowded the office in the second story of the Merchants Exchange, a broker known by the name of Bull Bridges, spent much of his time at the railing and as early as February, 1846, was able to catch the

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the contents of New York stock quotations from the sound of the instruments, and could wink them to a confederate. Bull Bridges was, in fact, the first practical sound operator. It afforded him great amusement.

Mr. E. F. Barnes a man of fine intellect, learned to operate in Utica, N. Y., in April, 1846, and on May 25, 1846, opened the first-office at Auburn, New York, and soon after became manager at Rochester. He early developed great facility in reading by sound and, with such ease, as greatly encouraged its use. On May 1, 1847, W. C. Buell at the Delavan House Albany, while Manager Carter was trying to get a message by paper, caught it by ear scarcely knowing how it came to him. Mr. Ten Eyck of the *Evening Journal* was present and made it the subject of an article so interesting that it was copied the world over. In 1849, when the Columbian, which Barnes had invented to supersede the Morse instrument in Kentucky was enjoined by the Court, Barnes went to Nashville and took messages by sound until arrested for contempt, the Court recognizing reception by sound as an essential part of the invention of Prof. Morse. By that time a number of the operators could receive by sound as readily as Barnes, notably James Leonard of Louisville, Kentucky, Anson Stager and George Durfee of Cincinnati, and many others. It was still however, very generally repressed by executive order and only came to be adopted when experience proved that the ability to receive in this way was easy of attainment, and that reception by sound was physically easier, more rapid, less subject to error, and messages more certain of reception thereby."

JAMES D. REID.

UTICA, N. Y. *Aug.* 23.

To the Editor of the Journal of the Telegraph:

IT isn't of much consequence who was the first sound reader, but I can go back of 1848, and beat Mr. Haskin's statement in the JOURNAL OF THE TELEGRAPH of May 16.

In November, 1847, I was a student in Utica, N. Y., and copied long portions of the press reports by sound, the first time, to the astonishment of the manager, Mr. Henry F. Makepeace. In Dec., 1847, I went to Hudson, N. Y., to take the office, and did most of my receiving by sound. I don't claim to be the oldest sound reader either. I think there are now a good many others who could, and did, before November, 1847, read by sound.

GEO. E. ALLEN.

NEW MADRID, MO., *Aug.* 14.

To the Editor of the Journal of the Telegraph:

IN your issue of July 10th, I find an article signed "Guss.," in which he states, that in a conversation with me, I mentioned the fact that a brother of mine was the first reader by sound. He is mistaken. It was a *brother-in-law*, Edmund F. Barnes, who at the time was an operator in the Rochester office. As near as I can remember it was in '45 or '46, that he first acquired the art. By correcting this mistake in the *name*, you will confer a favor.

J. H. BANCROFT.

Monthly Meeting of the Chicago Electrical Society.

CHICAGO, ILL., *Aug.* 21.

To the Editor of the Journal of the Telegraph.

THE regular monthly meeting of the Chicago Electrical Society was held in the rooms of the Electrician of the Western Union Telegraph Company on Thursday evening, August 16th.

About 40 members were present.

One new member was received.

Owing to the occupation of the members of the society in consequence of the extra work caused by the strikes and labor troubles, we were unable to make such preparations for this meeting as was desired and intended, but notwithstanding the exercises were very interesting, though not so scientific in their character as upon some former occasions.

Mr. John Desmond read a highly interesting paper entitled "Reminiscences," giving a vivid account of his early telegraphic experiences in 1849, and later, when the electric telegraph was first being brought prominently before the business public. While all present were fully aware that great changes had taken place during the intervening years, probably none had so fully realized the importance of these changes in their relation to the operator as they did while comparing the experiences of comrade Desmond with their surroundings to-day. And it occurred to at least one present, that this paper in a condensed form would prove very profitable reading to our entire JOURNAL OF THE TELEGRAPH family. It seems impossible to contrast the duties, salaries and general experiences of that early though not distant day, with the comparatively comfortable situations we now enjoy, and not realize that things are not nearly so bad with us as they might be.

Mr. C. C. Haskins followed Mr. Desmond, with a short chapter from his mental log-book, going back a year earlier, to a time when the good people of Buffalo were endeavoring to demonstrate the impracticability of the Electric Telegraph.

Mr. Haskins is a very pleasant speaker, and with a subject so interesting to his hearers, had no difficulty in retaining their closest attention.

President F. W. Jones gave a brief illustrated description of the Duplex system from its earliest inception to the present day. Owing to the lateness of the hour, he deferred an intended explanation of the Quadruplex and Multiplex systems to another time.

The President announced that partial arrangements had been made for the organization of a class, composed of such members of the society as wished to thoroughly acquaint themselves with the latest improvements in telegraph instruments and apparatus. In answer to an inquiry he stated that if desired two classes would be formed, one for the day and one for the night force. After which the meeting adjourned.

C. W.

How Duplicate Addresses should be Counted—Unnecessary Office Messages, etc.

MUSCATINE, Iowa, August 23.

To the Editor of the Journal of the Telegraph:

Is "John Smith and Henry Smith" or "John Smith or Henry Smith" properly speaking one address, and to be forwarded free as such?

I do not so consider, and should require payment for the "or" or, "and" Henry Smith, three extra words.

The number of office messages unnecessarily sent cannot be fully realized. For example, messages are frequently sent to be delivered to persons living in the country.

The office at which the message originates instead of giving the necessary information and instruction for delivery following the address, sends an office message for which the company receives no pay. Why this instruction should not follow the address and be checked as extra words, I fail to see, and I think, if fully ventilated in the JOURNAL OF THE TELEGRAPH, much unnecessary and unprofitable waste of time in the use of lines for sending these would be saved.

Again some, to my knowledge, do not consi answers to queries published in the JOURNAL OF THE TELEGRAPH as instructions, and only regard them when in the form of an executive order. These matters have been referred to in the columns of the paper, but the practice still remains as before.

Our correspondent is wrong in regard to ..ing and charging for messages with duplicate addresses. If the message is addressed to John Smith "and" Henry Smith, it should be charged with double tolls, and a copy delivered to each. If to John Smith "or" Henry Smith, no extra words should be charged for, and only one copy of the message delivered.

He is correct in regard to the practice of sending unnecessary office messages. Instructions for delivery, outside of the regular address of the message, should be forwarded with the message and paid for.

It has repeatedly been stated in the columns of the paper, that answers to queries and instructions given through the JOURNAL OF THE TELEGRAPH, in absence of an executive order are authoritative, and should be followed in cases where they apply.

EDITOR JOURNAL OF THE TELEGRAPH.

How Messages should be Checked.

OPELIKA, ALA., *Aug.* 20.

To the Editor of the Journal of the Telegraph.

THE following will show the form of checking messages years ago.

Opelika, Ala., Aug. 20, 1877.

To JOHN BROWN.
Homer, La., via Minden, La.
When will you return home?

JNO. SMITH.

5 op 1,00 & 50 paid.

Homer, La., Aug. 20, 1877.

To JNO. SMITH.
Opelika, Ala.,
I will return this week.

JNO. BROWN.

5. op 1,00 & 50 collect.
Via Minden, La.

Of late it is getting to be customary to trnsmit the word "paid" or "collect" first instead of the figures. In all double checked messages I think the old way should be adhered to, as there is less liability to err than by the present method.

J. H. PURNELL.

Information Desired.

DANVILLE, VA., *Aug.* 22.

To the Editor of the Journal of the Telegraph.

ABOUT eighteen months since I lost the use of my right arm, and have not been able to manipulate the key since, but find no trouble in writing with pen or pencil. Will you oblige by inserting this, for, perhaps, some telegrapher has been likewise affected and can afford me information how I may obtain relief.

C. P. HILL.

Spiritual or Mental Telegraphing.—The Telephone Outdone.

PUYALLOP, W. T., *July* 17.

To the Editor of the Journal of the Telegraph:

RECENTLY sitting in my chair in my office, my instrument being cut out at the time, I chanced to touch a door key to my tongue, my tongue was rapidly vibrated or deflected, giving my office call, D. Taking a coin in my hand, striking the door key I answered "I I I I—D. Who are you?" A spirit, was the answer. Question, "Where?" Answer; "In

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Heaven." Question, "How will Russians come out?" Answer; "Turks will gain the day by the armed intervention of England." Many other grave and amusing questions and answers were given.

Now I entirely disbelieve in modern spiritualism, was entirely sober, and not excited, I wish to learn the cause of the phenomena from scientific men, if they can explain it.

My solution is this :—That a brain nerve communicating with the tongue, the tongue receives and registers these deflections and an involuntary answer is felt, not the result of thought, but correspondingly intelligent, amusing or modest, as is the question asked.

Sound readers habitually grasp the next letter, word or sentence. To do this requires concentric force, as it were forming a mental lens converging all attention on the filling word or sentence, which probably has something to do with the phenomena.

M. Colvig.
Agent W. U. Tel'g Co.

The Annoyance of "Changed Checks" Overcome.

Kenosha, Wis., *August* 20.

To the Editor of the Journal of the Telegraph :

The expense and annoyance complained of by "D" of the Pacific Coast, respecting the running down of "changed check" errors, has been met, and I think overcome, by the Northwestern Telegraph Co., and in the way suggested by "D."

Three or four years ago this company adopted a rule providing that in all collect messages the word "collect" should follow the signature, and be counted in the check, but not charged for. Thus, a collect message containing 10 words is checked as 11 words.

Since the adoption of this rule, the old and oft-repeated excuse, "The message came paid," or was "sent collect" doesn't work, and the check errors are more easily traced, and the responsibility established, than when this excuse was so easily made, and so difficult to dispute. Some such rule, if put into practice by the W. U. Co., would save much postage and correspondence, and *would pay*..

Edward Curry.

GENERAL INFORMATION.

Lex.—Please give your opinion as to how the following words should be counted. I contend that they are contractions and should therefore be regarded as one word each. "Nightgram," "Wiregram," "Cablegram."

They should be counted as one word

E. C. Stevens.—A. B. sends message to C. D. subsequently A. B. leaves town and telegraphs to operator "forward answer to my message to X——" sig., A. B. C. D. sends answer to A. B. care E. F., and operator delivers message to E. F. at the same time notifying E. F. that A. B. was in X——, and had ordered the message forwarded there, E. F. pays for the message, opens it, and then orders it forwarded. A. B. claims I had no right to deliver it to E. F. How is it?

If the direction was received to forward the answer before it had been delivered to E. F., the latter had nothing to do with it, and it should not have been delivered to him.

Geo. M. Frink.—You will find on pages 99 and 102, of the Journal of the Telegraph for April 2nd, current volume, the information you ask for.

C. M.—1.—Should social messages be sent D. H. for no reasons except that the receiver is an operator or officer of a company having the right to use the wires for business? 2. Is a battery in operating room injurious?

1.—Private and social messages are governed by Rule 48. 2. Local batteries and gravity batteries generally are not injurious when kept in offices.

James Harrison.—The regular Morse alphabet, except in the United States, so far as we are informed, is used only in Canada and on the International Telegraph Company's lines in Cuba. In Europe a modification of the Morse alphabet, called the International, is generally used.

C.—What words in a forwarded message should be counted as extra words?

See Rule 4. The words and figures denoting the original place and date of the message should be charged for.

C. O. Flaten.—Have not the information you ask for.

The Telegraph.

THE SUBMARINE TELEGRAPH COMPANY.

The report of the directors state that the receipts for the six months ending the 30th of June last have amounted to £59,903, being £2,994 in excess of the corresponding period of the year 1876. There has been a small increase in the expenses, but the result of the business for the last half year enables the directors to recommend a dividend at the rate of seventeen and one-half per cent. per annum, and to carry over a balance of £833 to the next account. The work referred to in the last report, in respect of the La Panne and Calais cables, has been successfully completed, and the shore ends of those cables, are now landed in St. Margaret's Bay. The land line in Jersey in connection with the submarine cable between the Channel Islands and France has been renewed, and the cost thereof, £447, has been charged against the revenue.

Reduction of Telegraph Rates. Bad Condition of Military Telegraph Lines.

The San Diego (Cal.) *Union* states that a further reduction of rates has been made on the Military Telegraph Line. Ten word messages can now be sent from San Diego to any one of the following stations, for twenty-five cents currency, viz: Fort Bayard, Silver City and Ralston, New Mexico; Goodwin, Camp Grant, Tres Alamos, Tucson, Florence, Maricopa Wells, Phœnix, Wickenburg, Prescott, Stanwix, and Yuma, Arizona; and Campo, California. The present condition of a majority of the wire-supports of the Arizona line is defective. The poles cannot be replaced from line receipts, as no fund accrues. No adequate appropriation for repairs or renewal has been made by Congress, and the outlook is that unless the California representatives unite with the Arizona and New Mexico delegates in influencing prompt legislation, the lines will fail to work from the decay of the poles.

A New Railroad Telegraph Line.

A new telegraph line has just been completed from Philadelphia to Atlantic City, for the Philadelphia and Atlantic City R. R. Co. The line is 55 miles long and has ten offices.

This line was built under contract by Messrs. L. G. Tillotson & Co. of New York, under the personal supervision of Mr. Charles McLaughlin, who has charge of the branch house of the firm at Philadelphia. The entire work, including construction of line, laying cable at Atlantic City, establishing ten offices, etc., was completed and delivered with everything in working order in 17 days from its commencement.

Another Linesman Killed by Lightning.

In a severe storm of Monday, August 13th, J. A. Boyd, telegraph line repairer for the Air Line Railroad was struck and killedby lightning while repairing the wire near Longview, Ga. Mr. Davis, operator, who was assisting him, was severely injured by the same shock. They were engaged in putting a short piece of wire into the line, when the flash came and both were instantly prostrated. When Mr. Davis became conscious, Boyd was lying about ten feet from him on the edge of an embankment. He was groaning a little. It was about fifteen minutes before Mr. Davis was able to render him any assistance, and during this time Boyd rolled down the bank some fifteen feet, and when he did finally reach him he was dead. It was raining very hard at the time. Mr. Davis was severely shocked by the same stroke, and suffered severely from this cause.

A New Fire Alarm Telegraph Company.

Messrs. Gamewell & Co. have sold the patents and good-will of the American Fire Alarm Telegraph Company to a new organization entitled the Gamewell Fire Alarm Telegraph Company, of which Mr. L. G. Tillotson is President.

The business will hereafter be carried on by the new company, whose office is at No. 8 Dey street, in this city.

A Defaulting American District Manager.

Walter W. Otley, late manager of the office of the American District Telegraph Company at No. 270 West Twenty-third street, in this city, has proved to be a defaulter, and is a fugitive from justice. It has been discovered that he has been robbing the company, in a small way, for the last two years by falsifying the pay rolls of the messengers attached to his office. The whole amount of his stealings in this way, it is stated by the officers of the company, will not exceed $200. He is a man about 45 years old, was formerly a conductor on the Long Island Railroad, and had been in the employ of the company abont three years. He has not yet been arrested.

An Efficient Telegraph Superintendent.

Telegraph companies generally are to be congratulated on always having the right man in the right place, when an emergency arises. During the excitement attending the riots, District Superintendent James Merrihew, of the W. U. Southern Division, remained in the Philadelphia main office uninterruptedly from Saturday, July 21st until Tuesday, July 24th—a watch of over seventy consecutive hours. During a portion of this time he was closeted with Governor Hartranft, and his clear judgement not only saved much destruction to telegraph property, but, doubtless, averted many of the calamities which at one time were considered inevitable. Mr. Merrihew and the Governor were in communication with all parts of the State from the office at Tenth and Chestnut Streets; and, while the newspapers are extolling the promptitude and clear-headedness of Governor Hartranft, it would be wrong not to put on record the merits of his temporary and unassuming coadjutor.
—*The Operator.*

Preservation of Telegraph Poles.

M. Tiveyrat proposes to protect the portions of telegraph poles which are buried in the earth by sleeves of galvanized iron about 0·4 inch in thickness, covered with tar or red lead. The sleeves are imbedded in the wood of the post and extend somewhat above the ground. Tar is applied to the upper joint so that no water can enter between the sleeve and the wood, and the lower part of the former is bent over the bottom of the post and covered with an iron cap.

(From the *Detroit Free Press.*)

More About the Hydro-Electric Telephone.

To the Editor of The Detroit Free Press.

W. U. Telegraph Co., Chicago, Aug. 16.

I notice an article copied from *The Free Press* describing another telephone called the hydro-electric telephone. It says "the entire instrument is perfectly simple in its construction, and the only wonder is that men of the first ability should have

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labored so long and overlooked principles and facts with which they must have been familiar, and which appear to be the only avenue through which a successful solution of practical telephone communication can be reached."

I have no doubt the device described was unknown to Mr. Richmond, and he deserves credit as an original inventor. But the "principles and facts" had not been overlooked, as the writer supposes. Thousands of experiments in telephonic research have been made by myself and others that have never been published. Mr Richmond will find his hydro-electric telephone accurately described by drawings and specifications filed as a caveat in the Patent Office in 1876 and renewed in 1877. ELISHA GRAY.

Electric Train Signals.

A PATENT electric system has lately been introduced on the trains of the Philadelphia, Wilmington, and Baltimore Railroad. This system supercedes the present bell and cord arrangement to communicate with engineer, and also gives a continuous automatic alarm on the locomotive whenever any portion of the train becomes accidentally detached. The arrangement is also applied to freight trains.—*Railroad Gazette.*

Brief Mention.

COLONEL R. C. CLOWRY, assistant general superintendent of the Western Union Telegraph Company, has returned to Denver from Georgetown, Central Idaho and other points in that direction. Colonel Clowry has now traversed, and officially examined into the affairs of the extensive corporation of which he is manager in the West, all over Colorado and New Mexico, and expresses himself pleased with the condition of this branch of the service. There is probably no man occupying a position similar to superintendent Clowry, who so completely masters every detail of his charge as he does, and the perfection which marks the operation of the Western Union Telegraph Company in the West, is very largely due to his able supervision.—*Denver Tribune.*

Col. Wm. H. Reynolds, of Providence, R. I. has gone to England, it is said, for the purpose of organizing a company to introduce the speaking telephone of Prof. Bell.

A branch office of the Western Union Telegraph Company has been opened in Butler Exchange, Westminster Street, Providence, R. I., which is in charge of Mr. Charles G. A. Peterson, formerly operator at Rocky Point, R. I.

The American District Telegraph has been introduced in Fall River, Mass., in connection with the Western Union Telegraph Company. Several instruments have already been attached, and orders are on hand for fifty or sixty more.

London *Engineering* says: "The electrical illumination of the Lyons railway station is being completed They are now using twelve electric lamps. This number will be enlarged successively to twenty-four lamps, fed with one light-producing and one light-distributing machine. It is believed that 22-horse power will give a power of 2,400 gas-lamps, using 100 litres each per hour.

The *Tipton* (Ind.) *Times* of August 16th, says:—We understand that on last Saturday during the storm at Kempton, the telegraph operator at that place failed to disconnect the wire from the battery, and the lightning struck the wire running into the office, tearing the battery to pieces and stunning the operator so badly that he was unconscious for near an hour.

It is reported that the Government is to build a signal station and observatory on the top of Ascutney mountain, in Windsor, Vermont, at a cost of $20,000.

It is proposed to connect Block Island with the rest of the world by telegraph. Petitions have already been numerously signed to make a signal station at the new lighthouse on the south end of the island, and then lay a land line of telegraph to Sandy Point, or about where the old lighthouse stands; from there lay an ocean cable to the nearest point on the Rhode Island coast, which is near Point Judith, and within six miles of Charlestown.

Bell's Telephone has been placed upon a private line connecting the editorial room of the *Cincinnati Gazette* with the residence of the editor in Clifton and is said to work very satisfactorily.

Lightning struck a hive of bees in Kansas the other day. The painful story is soon told. The misguided lightning came out of that hive quicker than it went in, and went off into space with its tail between its legs. Moral.—Never pick a quarrel when you are not acquainted with the folks.

Messages to Scittico, Conn., should be sent to Hazardville, instead of Thompsonville, Conn.

Foreign Telegraphic Notes.

ACCORDING to a comparative return published in the New Zealand *Government Gazette*, 29,308, messages, of the cash value of £16,357, were transmitted over the telegraph lines in that colony, during the quarter ended March 31st last; as against, 270,312 messages, valued at £15,470, during the corresponding quarter of last year. The value of government messages transmitted was, £4,391 for the quarter last year, and £4,546 for the quarter ending March 31st last.

The report of the Cuba Submarine Telegraph Company, states that the gross receipts for the half year, including the balance brought from last account, amount to £19 779, and the expenses to £5,340, leaving a sum of £14,439, out of which the directors have placed £4,625 to the credit of the reserve fund, increasing that fund to £20,000. The balance, after providing for the preference dividend, will admit of a dividend on the ordinary shares at the rate of 8 per cent. per annum, and leave the sum of £414 to be carried forward.

The number ef messages passing over the lines of the Cuba Submarine Telegraph Company, during the month of July, was 2,362, estimated to produce £3,000, against 3,004 messages, producing £2,791 in the corresponding month of last year. The traffic receipts for the month of May, estimated at £3,900, realised £4,109.

The last section of the underground cable, from Berlin to Mayence, has been laid at the latter town. This is the first long subterranean cable ever laid, the distance being about 600 kilometres. The wires are twisted together and covered with hemp and iron. The cost is, it is stated, about six times more than for the same number of overground wires. This makes the seventh underground cable between Berlin and the Western frontier.

The Eastern Telegraph Company's traffic receipts for the month of July amounted to £42,713, and to £31,076 in the corresponding period of 1876.

The traffic receipts of the Direct Spanish Telegraph Company for the month of July amounted to £834, against £538 in the corresponding period of last year.

The receipts of the Great Northern Telegraph Company in July, were £19,187. Total receipts, January 1 to July 31, 1877, £115,007; corresponding months, 1876, £115,876; corresponding months 1875, £93,844.

The receipts of the Submarine Telegraph Company for the month of July amounted to £9,943. and for the corresponding month of the preceeding year to £9,461.

It is stated that the gain by duplex working on the Aden to Bombay cables, is from 75 to 95 per cent. on the traffic. Time lost in switch turning in simplex working, is saved in duplex working. A clerk is also saved at each station in the working of the two cables.

Advices from Callao to August 1st, bring news o further destruction by earthquakes on the South Coast. The cable from Callao south had been broken, owing, it was supposed to the earthquakes.

Messrs. Morton, Rose and Co., of London, announce the payment, on September 1, of the coupons then due on the Western Union Telegraph Six per Cent. Sterling Loan.

The Western and Brazilian Telegraph Company have received information of the repair of the Transandine Company's line over the Andes, thus re-establishing telegraphic communication with the West Coast of South America.

The amount of telegraphic wire and apparatus exported this year from Great Britain was £924,985; last year in the seven months £324,712.

The earnings of the Anglo-American Telegraph Company, for the 16th of August, amounted to £1,440.

It is stated that Mr. Hooper has bought from the liquidators of Hooper's Telegraph Works, with the consent of the Masters of the Rolls, the company's mortgaged property for £120,000.

The death is announced of Col. Robinson, R. E., the Director General of Telegraphs in India. He died at sea August 7th. He had been at the head of this department for ten years, and had completely revolutionised it. When he took it in hand its administration and condition was at zero point. He left it one of the best organized telegraph departments in the world.

It is announced that a new thermo-pile, based on Clamond's system, will shortly make its appearance in England.

Resolutions of Respect for Mr. Charles Bronson, Deceased.

AFTER the funeral services of Mr. Charles Bronson, late agent and operator at Lima Station D. & M. R. R., Columbus Grove, Ohio, on Sunday, Aug. 19th, he having died from injuries received by falling under a freight train, a meeting of employés was held in one of the special trains provided for the transit of the employés of the company.

A large number of gentlemen were present and the meeting was called to order by calling Jno. A Gardner, of Lima, to the chair, and the election of A. M. Kuhn, of Wapokneta, as Secretary, W. C. Tingle, of Columbus Grove, Jno. A. Doran, of Troy, and Geo. W. Lishawa, of Cincinati, were appointed a Committee on Resolutions, and in a few moments reported the following preamble and resolutions which were unanimously adopted:

WHEREAS, God in his Providence has seen best to remove from our ranks, by death, Chas. Bronson, Agent and Operator at Columbus Grove, and that in this removal we have lost a most highly esteemed fellow laborer, therefore be it

Resolved, that we, his fellow laborers, while recognizing the hand that has afflicted, and bow in perfect submission to the stroke, express our sorrow that one so gifted should be so summarily taken from us and a life of great usefulness, finding consolation only in the fact that what is our loss is his eternal gain.

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Resolved. That to his bereaved family we tender our earnest sympathy; realizing that while we have lost a comrade, we have learned to esteem for his manly integrity, to admire for his business qualifications and to love for his warm, kind heart, the wife has lost a noble and affectionate husband, the children an indulgent father, and the brother and sister a brother whose life was such as to command the deepest respect and love of all men with whom he came in contact.

Resolved. That we tender to the officials and assistants of the C. H. & D. & D. & M. railroad our thanks for the special trains enabling us to pay our respects to the deceased brother, and failing in language adequate to our appreciation, we call their attention to this presence that it may speak for us wherein language fails.

Also our thanks are due to the Odd Fellows' Lodge at Columbus Grove, and the Committee of Arrangements at the same place, for the labor performed by them, and to all and any others who may have done aught to add to the honors conferred upon the deceased.

Resolved. That these resolutions be published in all newspapers published on the line of the D. & M. railroad, in the JOURNAL OF THE TELEGRAPH, *Operator*, *Railway Aid* and *Expressman's Gazette*; a copy furnished the family of deceased, and one to Mr. R. M. Shoemaker, Prest., Mr. L. Williams, Gen'l Supt., Mr. J. H. Weller, Asst. Supt., and Mr. A. M. Matheany, train dispatcher.

Tariff Bureau.

SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE
WESTERN UNION TELEGRAPH COMPANY,
New York, September 1, 1877.

To all offices on Western Union Lines:

The following changes and additions have been made since the date of the last circular:

GENERAL INFORMATION.

ARKANSAS.
Palestine, reopened.
CONNECTICUT.
* * Scittico, Free from Hazardville.
* * Somers now 25 cents by stage do.
* * Somersville now 15 cents " do.
DELAWARE.
Clayton, Dover, Moorton, Smyrna and Wyoming will hereafter be in Square 67.
GEORGIA.
Jonesboro, reopened.
Milner, reopened.
INDIANA
* Florence, reopened.
261 Leesburg, closed.
* Patriot, reopened.
* Rising Sun, reopened.
* Vevay, reopened.
300 Bloomville, in supplement should read 300 Boonville.
KENTUCKY.
Hereafter the extra charge of 10 cents to Bourbon House and Bourbon House Stock Yards (given under Louisville in tariff book), will be discontinued.
Ludlow is now an other line office, 50 and 3 Lexington.
Nicholasville reopened as an other line office, 25 2 Lexington.
MISSOURI.
388 Kohoka, P. O. Address Cahoka.
* Sweet Springs, closed. Messages will hereafter be delivered from Brownsville; charges for delivery, 25 cents.
NEW BRUNSWICK.
* Madisco, closed.
NEW JERSEY.
Camden Abbatoir closed.
* Ogdensburg, 25 2 Middletown, N. Y.
NEW YORK.
101 Bath is in Steuben Co.
33 Bath (Summer office) is in Kings Co.
139 Fairpoint, closed.
* Moira, closed.
OHIO.
Bolusville, should read Bowlusville.
* * Tremont, 75 Bowlusville.
PENNSYLVANIA.
* Barclay, now 75 Barclay.
* Monroston, now 75 Monroeton.
150 Cambridge P, O. A. Cambridgeborough.
QUEBEC.
* Point Au Chene, closed.
TEXAS.
Englewood, closed.

ADDITIONS.

CONNECTICUT.
* * North Somers. 150 special from Hazardville.
ILLINOIS.
358 Barrow.
347 Hartsburg.
327 Kumler.
328 Sigel.
KANSAS.
503 Elmdale.
475 Grantville.
447 Wilder,
KENTUCKY.
* Burgin Station, 25 2 Lexington.
* Hinton, 25 2 do.
* King's Mountain, 25 2 do.
* Somerset, 50 3 do.
* Williamstown, 25 2 do.
MARYLAND.
60 Cordova.
67 Lynch's.
NEW BRUNSWICK.
* Bridgetown, 30 2 Sackville.
NEW JERSEY.
42 Beach Haven.
NEW YORK.
33 Coney Island.
129 Coomer.
OHIO.
* * Newton Falls, 75 Braceville.
ONTARIO.
* Ashburnham.
* Blake.
PENNSYLVANIA.
151 Claremont.
75 Foot of Plane.
* * Byers, 25 Phœnixville.
* * Cambria, 25 do.
* * Chester Springs 25 do.
* * Holmans, 25 do.
* * Kimberton, 25 do.
* * Pikeland, 25 do.
RHODE ISLAND.
* * Potters Hill, 15 cents by stage, Westerly.
TENNESSEE.
265 Victoria.
TEXAS.
472 Sour Lake Station.

ATLANTIC CABLE.

We are notified that the Bahia Rio Janeiro cable in South America is interrupted. Messages for Rio de Janeiro and places beyond will be forwarded by the best means obtainable until the break is repaired. No alteration of rates.

The route *via* Teheran is now in working order. The route *via* Siberia is interrupted.

REDUCTION IN RATES.

On and after Monday, September 3d, 1877, the present *square rate of forty cents will be reduced to twenty-five cents*, by all offices in the following named states:

Alabama,	Mississippi,
Connecticut,	Missouri,
Delaware,	New Hampshire,
District of Columbia,	New Jersey,
Florida,	New York,
Georgia,	North Carolina,
Illinois,	Ohio,
Indiana,	Pennsylvania,
Iowa.	Rhode Island,
Kentucky,	South Carolina,
Maine,	Tennessee,
Maryland,	Vermont,
Massachusetts,	Virginia.
Michigan,	West Virginia,
Minnesota,	Wisconsin. also

Stanstead and Montreal Junction, in the Province of Quebec, and Algiers, Amite, Baton Rouge, Chef Menteur, Clinton, Frenier, Hammond, Kenner, Manchac, New Orleans, Ponchatoula, Rigolets, Tangipahos, and Tickfaw in Louisiana.

This change is not to be applied to offices not named or indicated in the foregoing list; and offices having a forty-cent rate to places in New Brunswick, or to places west of the States named, will retain their forty-cent rate to such offices; all others should carefully erase all the "forty" rates from their tariff of square rates, and insert "twenty-five" as the rate to be used hereafter.

It will be seen that this reduction of the forty cent square rate to twenty-five cancels the present "*Local*" rates now in use to and from the offices within the territory described.

EXCEPTIONS: As New York city and a number of offices in New England distant more than one hundred miles from squares 14 and 17 have a forty-cent rate to those squares, their rate to "14" and "17" should therefore not be changed. Offices in squares 9, 10, 11, 13, 14, 15, 16, 17, 20, 21, 23, 24 and 27 are the only offices entitled to a twenty-five cent rate to square "14" and offices in squares 11, 12, 14, 15, 16, 17, 18, 20, 21, 23, 24, 25, 27, 28, and 31 the only ones entitled to a twenty-five cent rate to square "17."

The forty cent rate from square 41 to square 67 and vice versa should not be changed.

On and after Monday, September 3d, 1877, there shall be no rate higher than one dollar between Western Union offices within the territory described in the foregoing order, and no rate higher than one dollar and twenty-five cents, between the same offices and the Western Union offices in New Brunswick and Nova Scotia. Rates higher than these amounts to and from the offices designated, should therefore be reduced on the day specified, and the lower rates adopted and kept in operation until further notice.

Other changes embracing the rates to and from offices west of the States hereinbefore named are now being arranged and will be put in effect hereafter.

WILLIAM ORTON,
President.

BORN.

ALLEN.—In Fort Wayne, Ind., August 10, 1877, to CHARLES E. ALLEN, operator Fort Wayne, Muncie & Cincinnati, R. R., a daughter.

ALLEN.—In Ashtabula, Ohio, Aug. 12, 1877, to SHELDON W. ALLEN, operator Western Union Telegraph office, a son.

EBY.—July 25, 1877, to S. G. EBY, manager of the Western Union Telegraph office at Weatherly, Pa., a son.

PENNINGTON.—Aug 8, 1877, to A. O. T. PENNINGTON, manager Western Union Telegraph and agent Mo. Pacific Railway and U. S. Express Co's at Knobnoster, Mo., a daughter

SHEPLER.—August, 27, 1877, at Perrysburg, Ohio, to C. B. SHEPLER, agent and operator D. & M. R. R., a son.

Inventions.

UNDER THIS HEAD THE TITLES OF ALL ELECTRICAL AND TELEGRAPHIC PATENTS ISSUED FROM THE UNITED STATES PATENT OFFICE WILL BE PRINTED, AND THE CLAIMS OF ALL TELEGRAPH PATENTS IN FULL.

For the week ended July 31, 1877, and bearing that date

193,654.—LIGHTNING RODS. John Hewitt, Hamilton, Ontario, Canada. [Filed Dec. 21, 1876.]

For the week ended Aug. 7, 1877, and bearing that date.

193,991.—LIGHTNING RODS. W. W. Patterson, Corning, Iowa. [Filed April 30, 1877.]

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THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

P. O. BOX 3175, NEW YORK

NEW YORK, August 28, 1877.

ASSESSMENT No. 98.

SIDNEY WILLIAM CAPERS.

Sidney William Capers, died of consumption, at Camden, S. C., August 6th, 1877; his certificate, No. 1877, was issued March 3d, 1873.

This assessment is due from members holding certificates numbered up to, and including No. 3,071.

RECEIPT OF ASSESSMENTS.

ASSESSMENT No. 97.

19 33 38 76 82 146 148 169 171 228 232 240 334 397 430 438 466 468 469 470 471 499 503 505 506 507 508 516 592 597 604 622 642 652 667 710 714 781 786 800 801 802 808 839 871 906 909 934 938 941 944 1014 1016 1069 1077 1102 1104 1141 1210 1256 1274 1284 1286 1329 1405 1412 1421 1432 1437 1449 1465 1469 1471 1497 1537 1553 1554 1576 1596 1603 1605 1608 1619 1620 1626 1649 1653 1656 1692 1699 1700 1701 1704 1802 1863 1915 1934 1972 1978 1982 1991 1997 2022 2023 2027 2055 2065 2074 2075 2086 2094 2095 2112 2115 2132 2150 2162 2165 2191 2227 2231 2242 2256 2258 2259 2265 2284 2288 2303 2326 2350 2368 2385 2398 2401 2404 2405 2406 2407 2408 2409 2410 2411 2424 2426 2427 2428 2429 2435 2439 2441 2444 2452 2459 2489 2490 2491 2492 2499 2500 2504 2506 2517 2520 2525 2538 2541 2542 2545 2546 2552 2565 2577 2582 2584 2604 2623 2638 2641 2648 2671 2679 2693 2702 2714 2726 2739 2746 2748 2779 2781 2784 2796 2830 2835 2842 2844 2877 2898 2906 2914 2920 2957 2965 2966 2968 2969 2972 2973 2975 2996 3005.

ASSESSMENT No. 98.

4 64 88 93 103 131 138 177 208 211 217 235 269 276 277 286 289 301 302 346 420 560 742 783 832 843 874 901 915 943 1024 1092 1300 1357 1407 1489 1503 1516 1518 1522 1676 1678 1747 1815 1938 1970 1995 2066 2082 2097 2214 2240 2305 2310 2346 2363 2390 2396 2400 2468 2495 2532 2533 2543 2607 2614 2710 2723 2780 2802 2809 2867 2944 2971 2986 3004 3016.

Agents when approving applications of parties residing out of their district, should state on what agency list their names are to be placed.

All Communications should be sent to **P. O. Box, 3,175** to receive immediate attention.

Members who look to the JOURNAL OF THE TELEGRAPH for receipt of payments, will please take notice that the acknowledgement of payment of one assessment should be taken as a receipt for all previous assessments.

A. H. WATSON, *Secretary.*

THE GAMEWELL FIRE ALARM TELEGRAPH COMPANY.

Office, No. 8 Dey St. New York.

LUTHER G. TILLOTSON, President; CORNELIUS ROOSEVELT, Treasurer; CHARLES BELL, Vice-President; ARDEN S. Fitch, Secretary.

TRUSTEES.

LUTHER G. TILLOTSON,	CHARLES BELL,
CORNELIUS ROOSEVELT,	OSCAR VEZEIN,
ANSON STAGER,	GEO. G. ROCKWOOD,
ARDEN S. FITCH.	

Having purchased from Messrs. Gamewell & Co., late proprietors of the "American Fire Alarm and Police Telegraph," all their patents and "good will," this Company is now prepared to contract with cities and towns for the construction of this valuable adjunct to every well-regulated Fire Department.

This system of Fire Alarm Telegraph covered by the "Gamewell" patents, is the only *perfect, complete* and *reliable* system of Fire Alarm Telegraph in the world, and the only one which has yet established its claim to perfect reliability. It is now in successful operation in some 85 cities and towns in the United States and Canadas.

Any information desired at in regard the above system will be cheerfully and promptly furnished on application, at the office.

HOME LEARNERS INSTRUMENTS.

WITHOUT BATTERY.

Sent by mail POST PAID to any part of the United States, $4 50.

Same instruments, higher resistance, for lines 1 to 15 miles, $5 00 by mail prepaid.

See description in another column.

L. G. TILLOTSON & CO.,

New York,

THE NEW AND IMPROVED OPEN CIRCUIT BATTERY.

SPECIAL NOTICE.

In order to demonstrate the value and efficiency of our batteries, *to parties in the trade who have not tried them*, we will send to any address, on receipt of price, 2, 4, or 6 Sample Cells at $1.25 each net, so that they may test them or compare with the Lechanche.

We have manufactured them now for over a year, and sold a great many, none have been returned as exhausted, as yet.

Price $1.75. Liberal discount to the trade.

What is said about them by disinterested parties:

We use this Battery altogether in our business, and have done so since the improvements were made; and, from our long experience, using as we do more open circuit batteries than any other concern in New York, we have no hesitation in pronouncing it, in our judgment, the longest continuing and in every respect THE BEST BATTERY in use for Hotel Annunciators, Burglar Alarms, Electric Call Bells, Signal Bells, and, in fact, *for all open circuit work.*

We are perfectly satisfied that they do not interfere with any patents whatever. HOLMES BURGLAR ALARM TELEGRAPH COMPANY.

Send in your orders and they will receive prompt attention.

S. BERGMANN & CO.

120 Wooster Street, N. Y.

ELECTROTYPE CARDS.

Your name handsomely printed on 25 assorted Electretype Cards of Keys, Sounders, Relays, &c. 25 "Embellished Keys," (representing a Carrier Pigeon with a message in its bill,) and 25 assorted Visiting Cards, consisting of all the latest styles, for 50 cents, or 25 of either kind for 25 cents. Those who will act as agent for our fine and large assorment of Visiting Cards we will allow 35 per cent commission. Full agents' outfit post-paid for 25 cents.

F. P. MUNN,

Clyde, Wayne Co., N. Y.

TELEGRAPH SUPPLY CO.

CLEVELAND O.

AGENTS FOR THE

TELEPHONE

FOR OHIO AND INDIANA.

SEND FOR CIRCULAR.

236-247.

THE WATSON BATTERY.

Has every quality necessary to make it THE FAVORITE wherever it may be used—in telegraph offices, on private lines, in laboratories, or wherever constant, strong and reliable batteries are desired.

L. G. TILLOTSON & CO., 8 Dey Street, N. Y.

Sole Agents in the U. S.

COMPOUND TELEGRAPH WIRE.

MANUFACTURED BY

WALLACE & SONS,

ANSONIA, Conn.

OFFICE:—No. 89 Chambers Street, New York.

The recent improvements in the manufacture of the

COMPOUND TELEGRAPH WIRE,

have relieved it of the objections heretofore made to its general introduction and use.

By the

NEW PROCESS

of magnetic deposition of the copper on a core of steel wire, which is now in use at the manufactory at

ANSONIA, CONN.,

great improvement has been effected in its permanence and reliability.

Under the former process of manufacture there existed a liability of separation of the core and copper covering which greatly impaired its durability and value. By the new process this defect is entirely overcome.

When the character and value of the

NEW COMPOUND TELEGRAPH WIRE

become fully known it is confidently anticipated that it will be generally preferred to iron wire for telegraphic purposes.

The following are some of the advantages which it possesses over iron telegraph wire.

FIRST.—Its great tensile strength combined with its comparatively light weight, admits of a considerable reduction in the number of poles, insulators, cross-arms, etc., required.

SECOND.—Time and labor are economised in construction.

THIRD.—Its lighter weight relieves the strain upon poles at curves and angles, and consequently they are made to stand more firmly and with but little if any danger of prostration in case of extra strain, from sleet or other causes. Also a much larger number of wires may be strung upon the poles with less liability to crosses.

FOURTH.—The steel core is perfectly protected by a substantial covering of copper, which prevents oxidation, and makes it more desirable than galvanized iron, especially in places where bituminous coal is used.

FIFTH.—The weight of the compound wire is only about forty per cent. of that of iron telegraph wire of equal conductivity.

SIXTH.—Accident and temporary interruptions occur less frequently, on account of its ability to successfully resist breakage from sleet and violent storms.

PATENT JOINTS,

FOR COMPOUND TELEGRAPH WIRE.

Ordinary twisted unsoldered joints will hold but about one-third of the strength of wire of any description, while the same joints soldered will hold about two-thirds, thus showing that joints as usually made are never as strong as the wire itself.

Repeated tests have demonstrated the fact that the

PATENT JOINT

(which was originally devised especially for use with the compound telegraph wire) soldered, has more strength than the naked wire itself.

The cost of the Compound Wire as heretofore manufactured has limited its use. By the new process the wire can be manufactured and sold at prices which will compare favorably with those of galvanized iron wire of equal conductivity.

Attention is called to the following prices:

No. 8 per mile	$40 00
No. 6 "	46 00

These wires are the equivalents for all telegraph purposes of the best Nos. 8 and 6 galvanized iron wire now in use and are more durable and reliable.

They are manufactured to fill all the requirements of the standard tests of the Western Union Telegraph Company. The resistance of the No. 8 wire is guaranteed not to exceed 14 Ohms per mile, and No. 6, 10 Ohms per mile.

Wire of any size and resistance will be manufactured upon special orders and equally reasonable terms. A wire not exceeding in weight that of No. 8 galvanized iron wire and which is guaranteed not to exceed three Ohms resistance per mile is made when specially required.

The undersigned can be consulted in regard to the selection of wires, construction of lines, equipments, telegraph supplies, etc., and will respond promptly to all such applications.

Orders for the

COMPOUND TELEGRAPH WIRE

and

PATENT JOINTS

may be addressed to him or to WALLACE & SONS, as above.

CHESTER SNOW.

General Agent.

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A. G. DAY,

MANUFACTURER OF

KERITE INSULATED TELEGRAPH WIRE AND CABLES.

Manufactory, SEYMOUR, Conn.

Office, 120 BROADWAY, New York.

The Di-electrical properties of Kerite have been tested in every conceivable manner during the last few years and its superiority over all other kinds of insulation fully demonstrated.

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Samples of the core or insulated conductor of Kerite cables have for a long period been laid in the Caribbean Sea, yet the "teredo," which would have speedily destroyed other cables thus exposed, has left these entirely unharmed. And experimental lines on the Isthmus have been equally exempt from the ravages of the white ant, which destroys wood telegraph poles so rapidly that iron poles have been substituted.

The same qualities which render it so indestructible by all corrosive agents, insure its durability for an indefinite period in all climates.

Neither gutta-percha nor vulcanized india rubber will bear storage in tropical climates without rapid deterioration, and undergoing chemical changes, which destroy their essential qualities, while under the same conditions the Kerite insulation is not changed in any respect.

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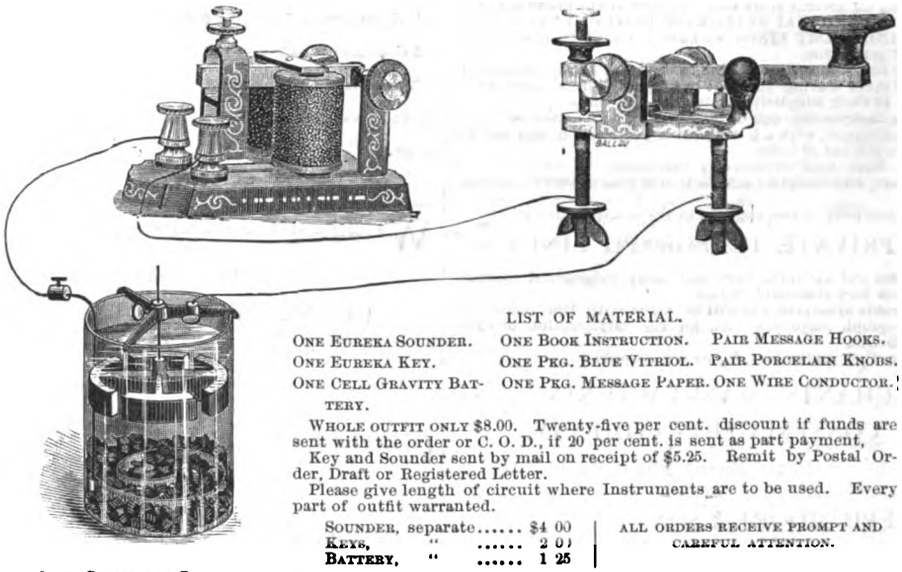

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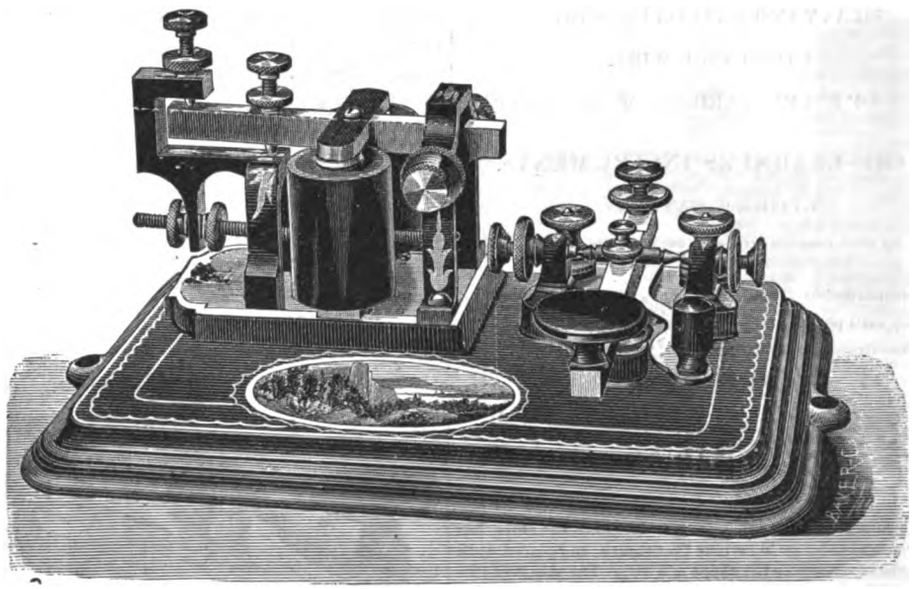

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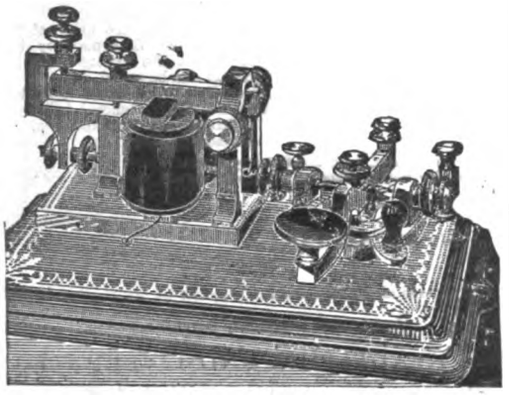

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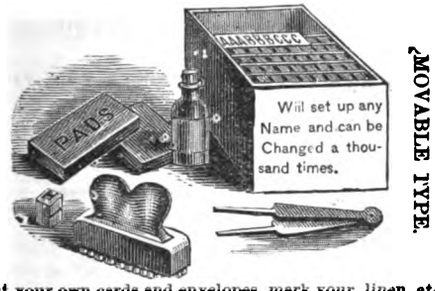

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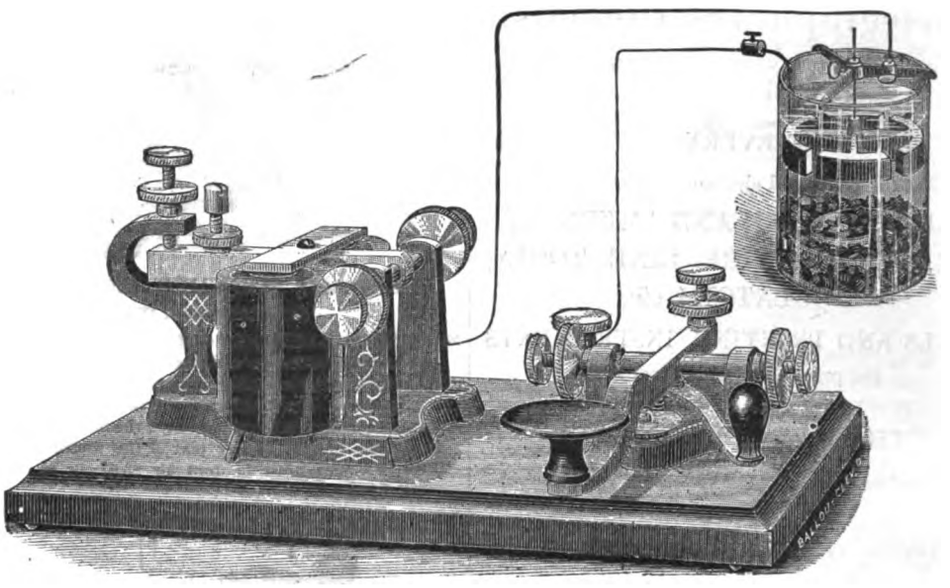

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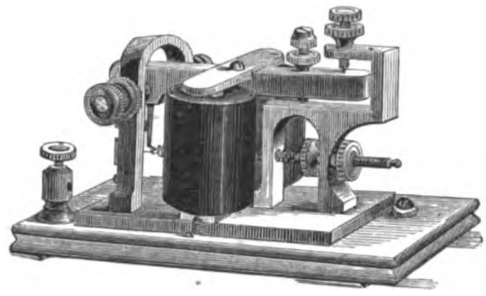

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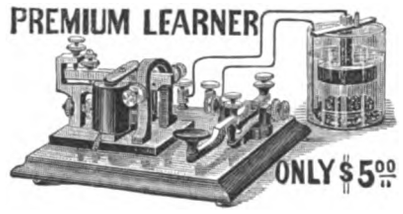

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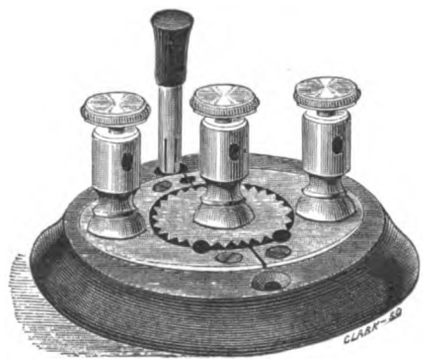

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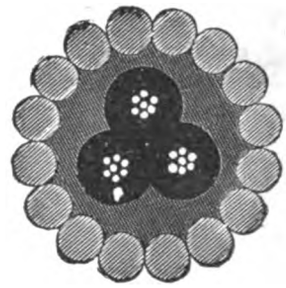

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ON THE REPRODUCTION OF MUSICAL TONES BY ELECTRO-MAGNETISM.

By V. LEGAT.

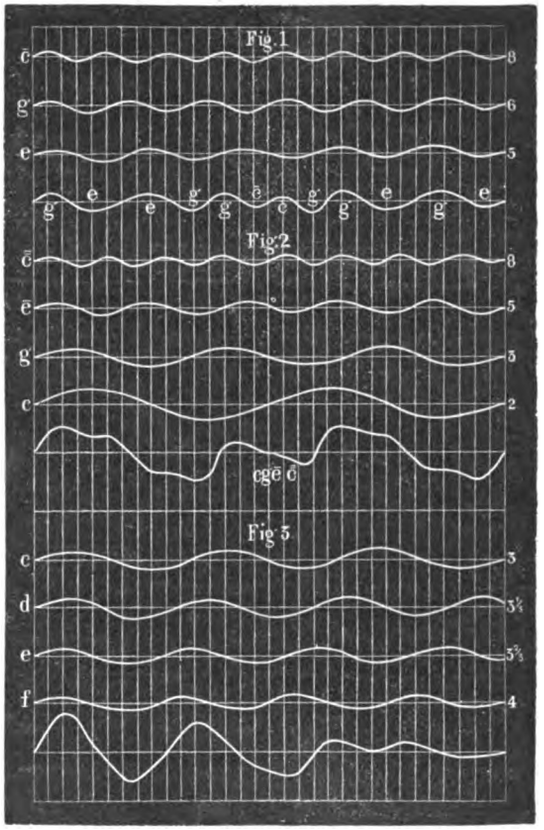
THE following observations on the subject of the reproduction of musical tones through the agency of electro-magnetism have recently been presented by Philip Reis, of Friedrichsdorf, at the Conference of Physics, and also at the meetings of the Free Institute at Frankfort-on-the-Main. In order that other experimenters may be induced to make further researches in the same direction, by which the sphere of usefulness of the electric current in its application to the transmission of the correspondence of mankind may be extended, it seems desirable that the results arrived at by Reis should become more widely known.

In the case under consideration, the problem which presents itself for solution is that of producing by the action of the voltaic current, audible signals or tones instead of visible signs.

It is well known that the sensation which we call sound is excited by the action of the vibrations of the atmosphere upon the tympanum or drum of the ear, and that these vibrations are conveyed from the tympanum to the auricular nerves in the interior parts of the ear, by means of a mechanical apparatus of wonderful delicacy and precision of action, consisting of a series of bones termed respectively the hammer, anvil and stirrup. In the process of reproducing tones by electro-magnetism, an artificial imitation of the mechanism of the human ear is employed, consisting of a stretched membrane corresponding to the tympanum, which by its vibrations opens and closes an electric circuit extended to a distant station by a metallic conductor.

Before proceeding to give a description of the apparatus employed, it will be well to devote some consideration to the process by which the ear distinguishes the vibrations of a particular tone, or the aggregate of the vibrations of all the tones which simultaneously act upon it, for by this means we may be enabled to ascertain the conditions under which the transmitting and receiving apparatus must act in order to effect the desired result.

If we analyze the process by which the ear distinguishes a simple sound, we find that a tone results from the alternate expansion and condensation of an elastic medium. If this process takes place in the medium in which the ear is situated, namely, the atmosphere, then at each recurring condensation the elastic membrane or tympanum will be pressed inward, and these vibrations will be transmitted by the mechanism above referred to, to the auricular nerves. The greater the degree of condensation of the elastic medium in a given time, the greater is the amplitude of the movement of the tympanum, and consequently of the mechanism which acts upon the nerves. Hence it follows that the function of the human ear is the mechanical transmission to the auditory nerves of each expansion and contraction which occurs in the surrounding medium, while that of the nerves is to convey to the brain the sensations thus produced. A series of vibrations, a definite number of which are produced in a given time, and of which we thus become cognizant, is called a tone.



The action which has thus reached our consciousness, being a purely mechanical one, may be rendered much more easy of comprehension by graphical delineation. If, for example, we assume the horizontal line *a b* to represent a certain period of time, let the curves extending above the line *a b* repre-

sent the successive condensations (+) and the curves below the line, the successive expansions (—), then each ordinate represents the degree of condensation or expansion at the moment of time corresponding to its position upon the line *a b*, and also the amplitude of the vibrations of the tympanum at the same moment.

It is scarcely necessary to remark that it is absolutely impossible for the ear to receive or distinguish sensations of sound in any other way than by taking cognizance of the number and of the amplitude of the vibrations communicated to the tympanum. We shall see however, that nothing more than this is required, in order to bring to our consciousness, not merely each simple tone, but every possible combination of simple tones. If several simple tones are produced simultaneously, the sound-conducting medium, whatever it may be, is subjected to a force which is the resultant of several simultaneously existing forces, acting upon each other according to the ordinary laws of mechanics. If all the separate forces act in the same direction, the resulting motion is proportional to the sum of the forces; if on the other hand, some of the forces act in an opposite direction to others the resulting motion is proportional to the difference between the opposing forces. In accordance with this principle therefore, we may construct from the condensation curves representing several simultaneous tones, a single resultant curve which will correctly represent the effect which is produced upon the ear by the combined action of the simple tones when produced simultaneously.

It may perhaps be objected that a musically trained ear distinguishes without difficulty each separate simple tone which forms a constituent of a composite tone, but it is equally true that an expert colorist can detect in any one of the various tints of green the particular tints of blue and yellow of which it was compounded. The fact in both cases may be accounted for on the same theory; that of a previously existing knowledge of the characteristics of the several factors of which the product is composed.

It will readily be understood after the above explanation, that curves graphically representing the various tones, chords, etc., may be constructed. An example of this method of graphic delineation will now be given.

Fig. 1 shows a curve representing a composite tone formed by the combination of three simple tones, in which all the relations of the components return successively.

Fig. 2 represents such a curve formed of more than three tones, in which the relations do not appear so distinctly, but a musical expert will readily recognize them, even when it would be difficult in practice for him to distinguish the simple tones in such a chord.

This method of showing the action of tones upon the human ear, possesses the advantage of giving the clearest illustration possible of the entire process. We may even understand by reference to fig. 3 why it is that the ear is so disagreeably affected by a discord.

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